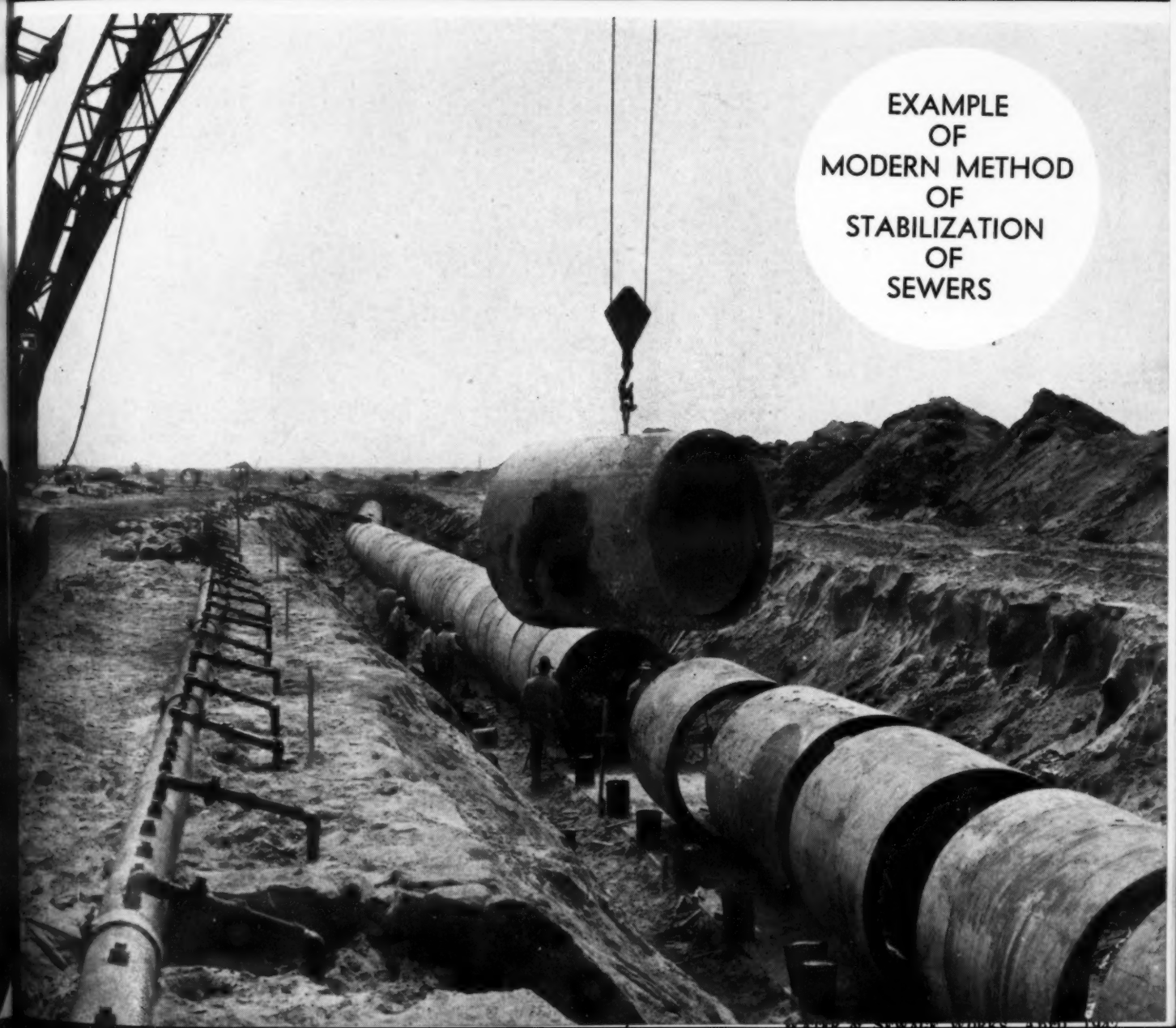
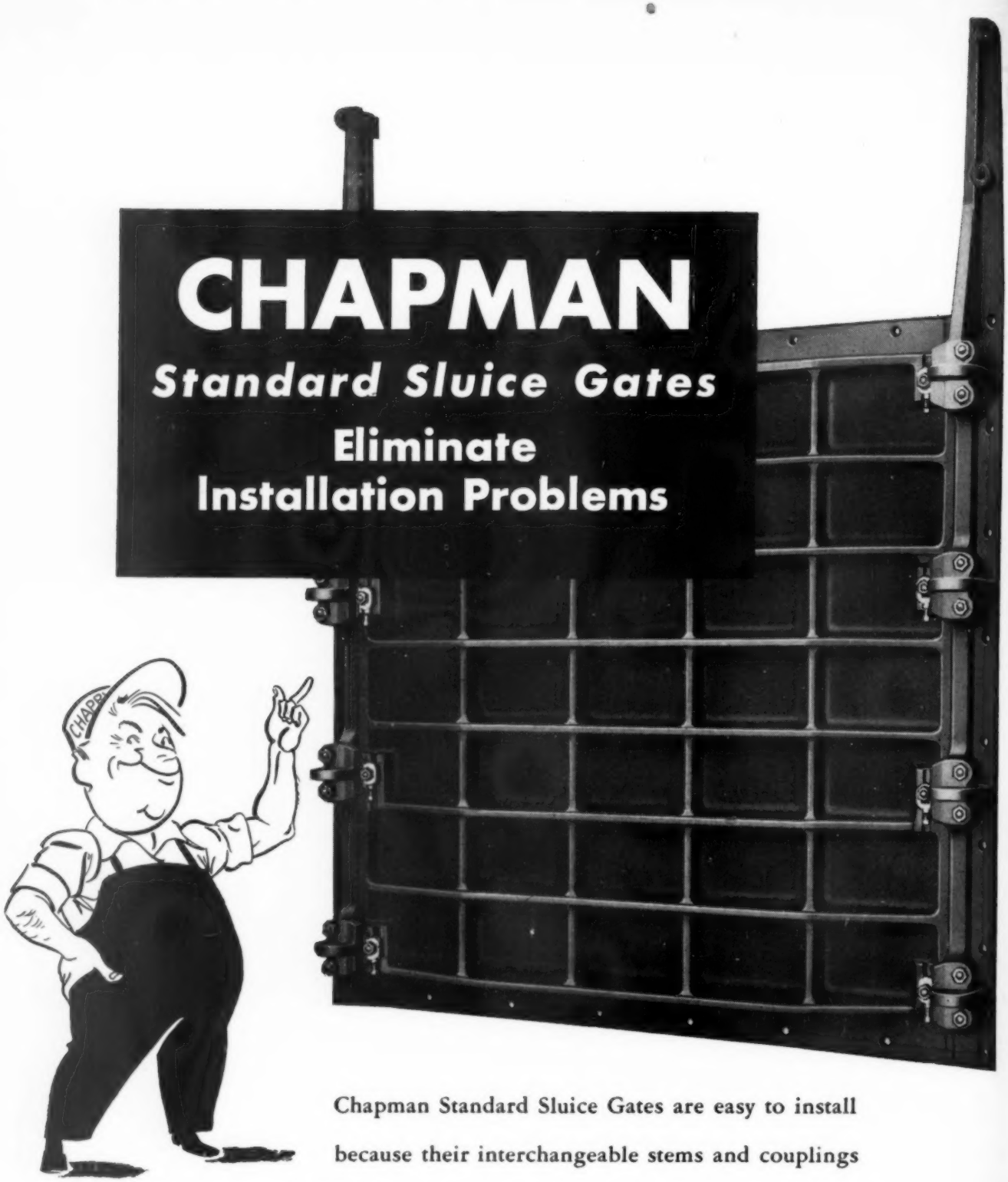
# WATER & SEWAGE WORKS



# CHAPMAN

## *Standard Sluice Gates*

## Eliminate Installation Problems




Chapman Standard Sluice Gates are easy to install because their interchangeable stems and couplings require no match-marking. They may be obtained with any type of operating control—manual, hydraulic cylinder or motor unit (completely enclosed in weatherproof housing, and delivered wired—ready for installation) Send for a copy of Chapman's Sluice Gate Handbook for complete information.

**THE CHAPMAN VALVE MFG. CO.**

**INDIAN ORCHARD, MASSACHUSETTS**


WATER AND SEWAGE WORKS, April, 1947. Volume 94. Number 4. Published monthly by Gillette Publishing Co., 22 West Maple St., Chicago 10, Ill. Per copy, 25c. Subscription rate: United States, $2.00 per year; Canada, $2.00 per year; Foreign, $3.00 per year. Entered as Second Class Matter, March 12, 1946, at the Post Office at Chicago, Ill., under act of March 3, 1879.

# MEASURING UP TO *Expectations* SPECIFICATIONS

All cold water meters must conform to standard specifications for accuracy established by the American and New England Water Works Associations. Any meter will meet these specifications when new. Some, like Empire meters, will exceed minimum accuracy requirements for new meters. But it's impossible to specify performance *after* the meter has been put in service and that's where true values are disclosed.

Empire meters, with their exclusive balanced oscillating piston construction, have a 63 year service record for superior performance. Extremely accurate when new, they will maintain initial accuracy for longer periods than any other design. Too, Empires are dependable in service. You can depend upon them for sustained accuracy and you can depend upon them for freedom from sticking and stopping. And you just can't beat the Empire for maintenance economy. Consider all the Empire advantages. You'll find they measure up to your expectations for the best in meter value. *Write for catalog.*

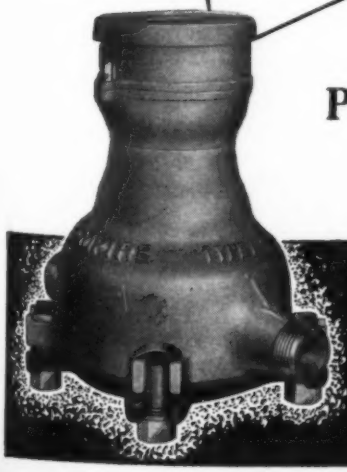
**PITTSBURGH EQUITABLE METER DIVISION**
Rockwell Manufacturing Company
Pittsburgh 8, Pa.

Atlanta Boston Chicago New York Pittsburgh
Houston Kansas City Los Angeles San Francisco Seattle Tulsa

**Empire Balanced Oscillating Piston in Snap Joint Measuring Chamber**

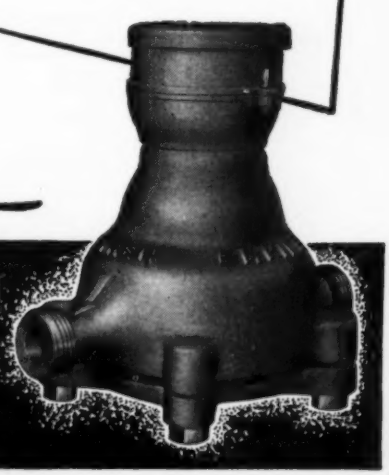
Here is the reason for Empire meter accuracy and dependability — the exclusive *balanced* oscillating piston construction that sets these meters apart from all others. This piston is so light it almost floats. Even minute flows will push it ahead rather than try to escape around it. The slightest dribble will move this featherweight piston and make it measure accurately. Its unique gliding action with bearing surface evenly distributed over the entire piston circumference reduces friction and wear to a minimum.

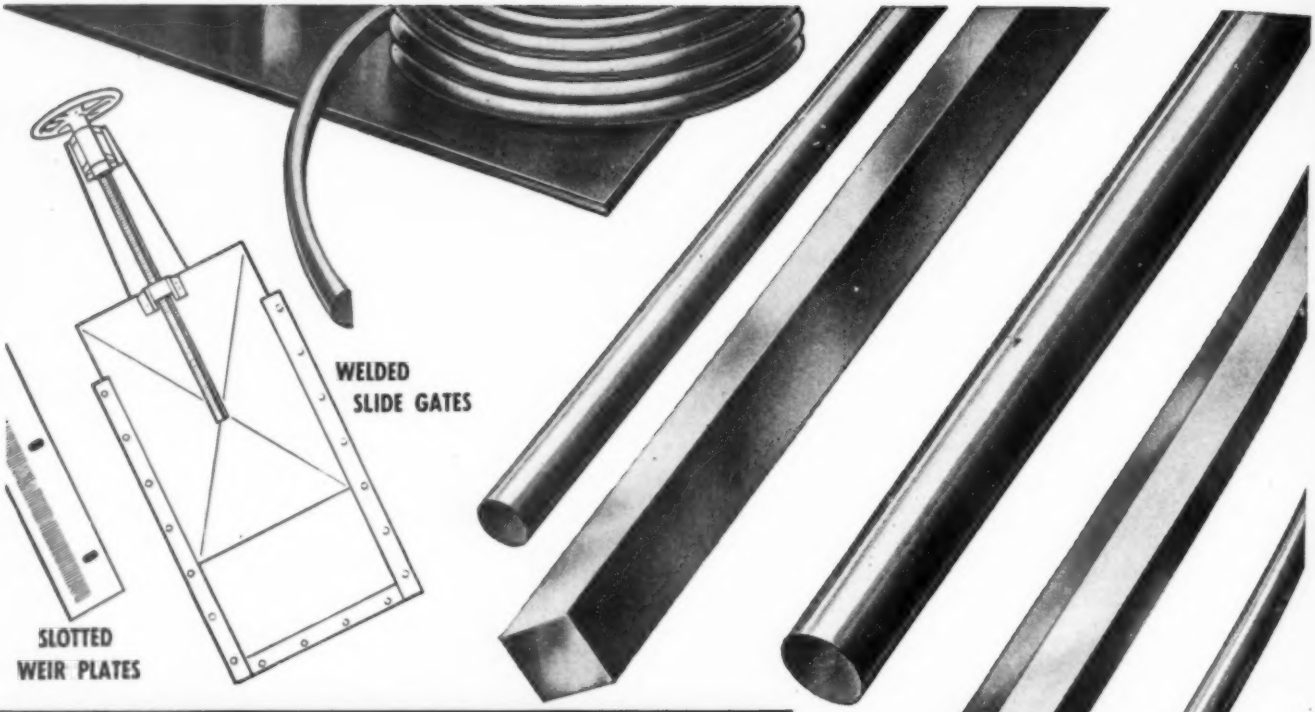
## PITTSBURGH-EMPIRE *Water Meters*



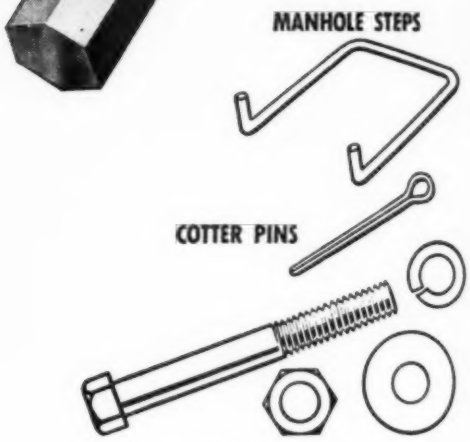
**EMPIRE TYPE 12**
Frost protected model with bronze case and breakable cast iron bottom plate
Described in Bulletin W-802

**EMPIRE TYPE 14**
All bronze model for use in warm climates
Described in Bulletin W-801






# Parts and Accessories Stand up in Service when made of Everdur Metal




EVERDUR* Copper-Silicon Alloys, developed and produced by The American Brass Company, are exceptionally tough, strong and resistant to corrosion. Made in compositions suitable for hot or cold working and machining, and in practically all commercial shapes, they lend themselves to economical production of items such as those illustrated.

Other items for which Everdur is widely used include coarse and fine screens, float chambers, swing gates, coarse bar rack aprons, effluent weirs and scum weirs, troughs, screen hoppers, baskets, valve springs, valve stems, spillway fittings and many others.

Because of the long, economical service rendered by Everdur, these durable alloys have become preferred construction materials for water works and sewage treatment equipment. For further information, ask for Publications E-11 and E-5. 48214 Rev.

* Reg. U. S. Pat. Off.

ANACONDA

**Everdur**

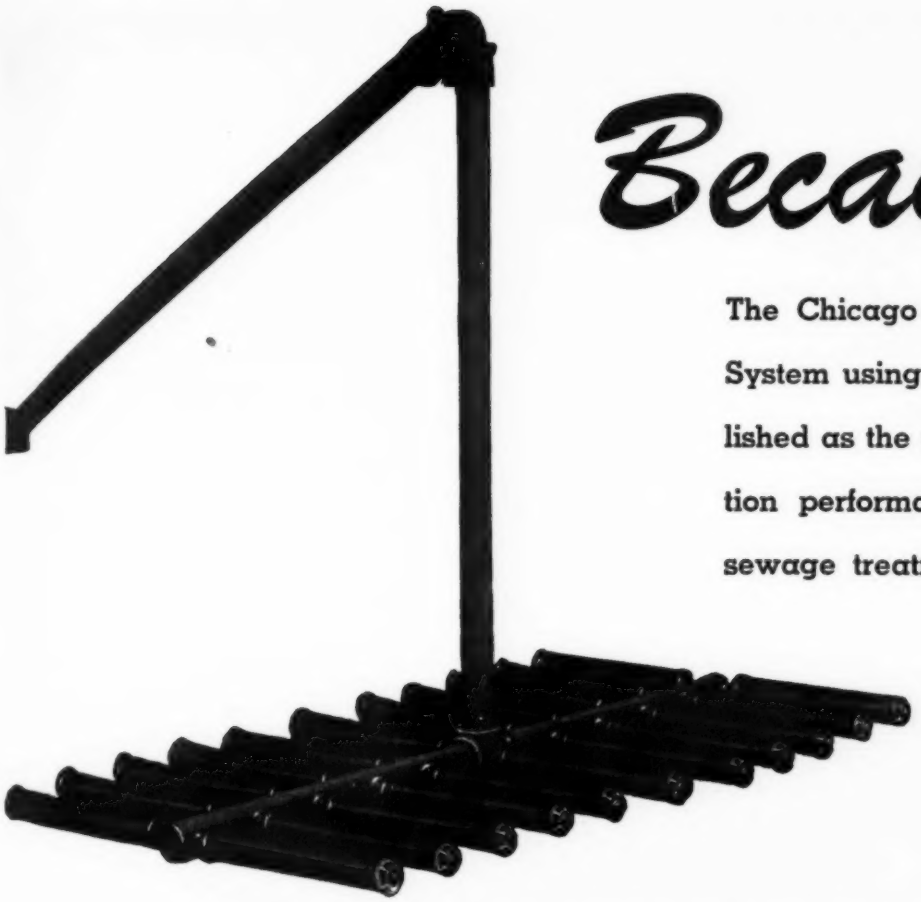
**COPPER-SILICON ALLOYS**

**THE AMERICAN BRASS COMPANY**

General Offices: Waterbury 88, Connecticut

*Subsidiary of Anaconda Copper Mining Company*

*In Canada:* ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*



# Because-

**The Chicago Wide-Band Air Diffusion System using Swing Diffusers is established as the criterion of superior aeration performance in activated sludge sewage treatment plants because . . .**

- Swing Diffusers can be raised to tank walk for rearrangement, addition or removal of tubes, or tube cleaning. Tanks need not be drained.
- Control orifice provides uniform air distribution to diffuser tubes.
- Tubes are located two feet above tank floor . . . blower discharge pressure is proportionately reduced.
- Wide band of fine bubbles prevents coalescing, increases contact volume and contact period between air and mixed liquor.
- The Wide-Band system, having greater air lift effect, develops better tank circulation characteristics.
- Tapered aeration is readily effected . . . adjustment of tube arrangement and air supply, can be made to meet oxygen demand.

**Operating results from over a hundred successful installations verify these statements. Swing diffusers may be installed to replace obsolete systems. The logical choice for new plants or for expanding present facilities.**

## CHICAGO PUMP COMPANY

### SEWAGE EQUIPMENT DIVISION

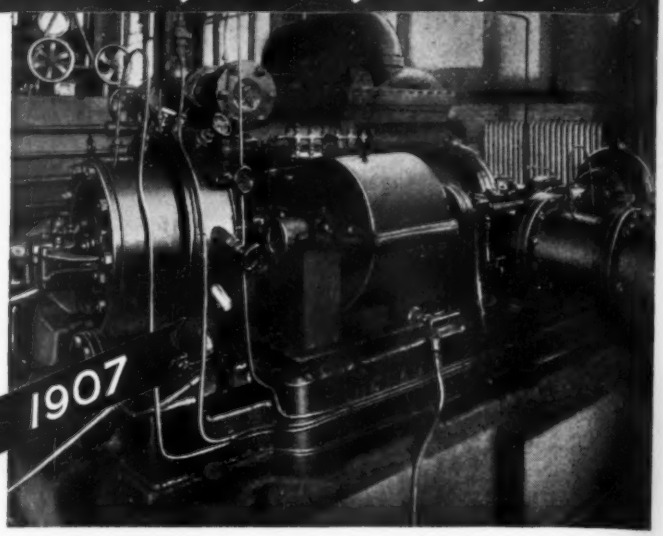
**2349 WOLFRAM STREET** — **CHICAGO 18, ILLINOIS**

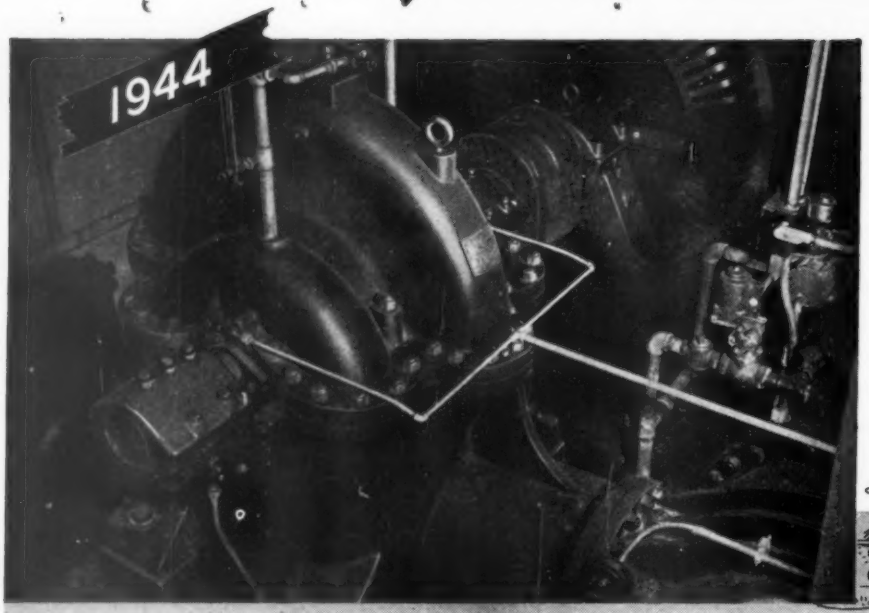
Flush-Kleen, Scru-Peller, Plunger, Horizontal and Vertical Non-Clogs, Water Seal Pumping Units, Samplers.

Swing Diffusers, Stationary Diffusers, Mechanical Aerators, Combination Aerator-Clarifiers, Comminutors.

*Sustained Efficiency Year after Year Brings Repeat Orders Year after Year*

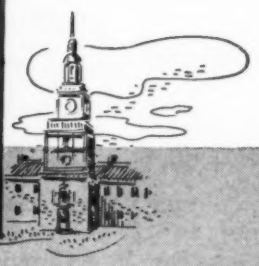
# DE LAVAL PUMPS *at Philadelphia*




**1907** *De Laval turbine-driven pump installed at Torresdale Station, Philadelphia in 1907.*

**1944** *De Laval 25 m.g.d., 245 feet head pump installed at Lardners Point Station, Philadelphia in 1943.*



Since the installation of the first De Laval centrifugal water works pump at Philadelphia in the year 1907, that city has purchased a total of 37 pumping units from De Laval, so satisfactory has been their performance. The repeated installation of De Laval pumps by that city has been due in no small measure to the high sustained efficiencies maintained over long periods of use by De Laval pumps—a fact substantiated by tests made on two units at the Shawmont Station, Philadelphia, where no measurable loss of efficiency was evident after six years of service.

4114

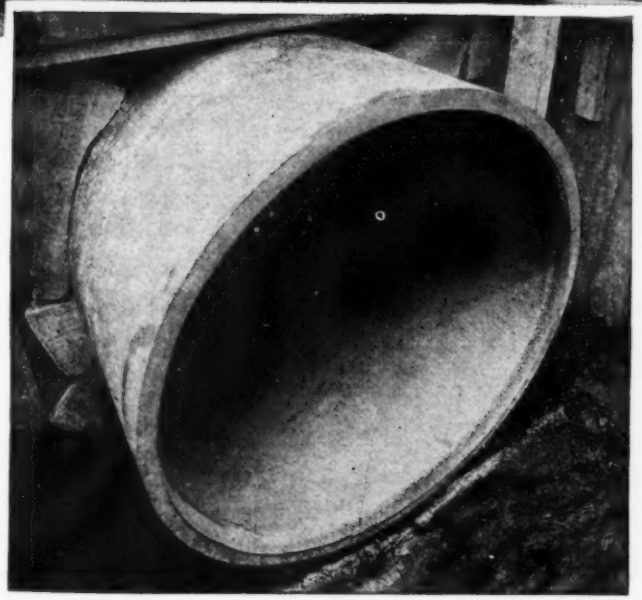
TURBINES • HELICAL GEARS
WORM GEAR SPEED REDUCERS
CENTRIFUGAL PUMPS • CENTRIFUGAL BLOWERS and COMPRESSORS • IMO OIL PUMPS

**DE LAVAL**

STEAM TURBINE COMPANY · TRENTON 2, NEW JERSEY

SALES OFFICES: ATLANTA • BOSTON • CHARLOTTE • CHICAGO • CLEVELAND • DENVER • DETROIT • HELENA • HONOLULU • HOUSTON • KANSAS CITY • LOS ANGELES • MANILA • MONTREAL • NEW HAVEN • NEW ORLEANS • NEW YORK • PHILADELPHIA • PITTSBURGH • ROCHESTER • ST. PAUL • SALT LAKE CITY • SAN FRANCISCO • SEATTLE • TORONTO • TULSA • VANCOUVER • WASHINGTON, D.C. • WINNIPEG
And Cities in Central and South America

# CENTRILINE GOES TO WASHINGTON ...for the third time!



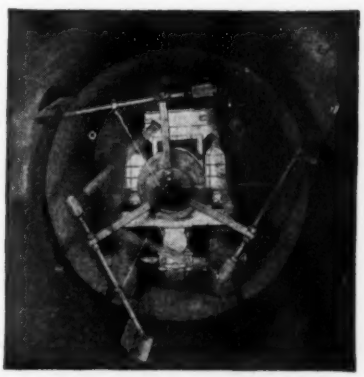
**ONCE** again Centriline was elected to service the nation's capital—and do another important reconditioning job for the Water Department of the District of Columbia. Nearly 30,000 feet of cast-iron pipe, varying in sizes from 30″ to 48″, were cleaned and cement lined—speedily and economically. This sleek new lining will provide a non-corrosive, non-tuberculating surface to shield the underlying metal—assuring a permanently high coefficient and increased longevity.

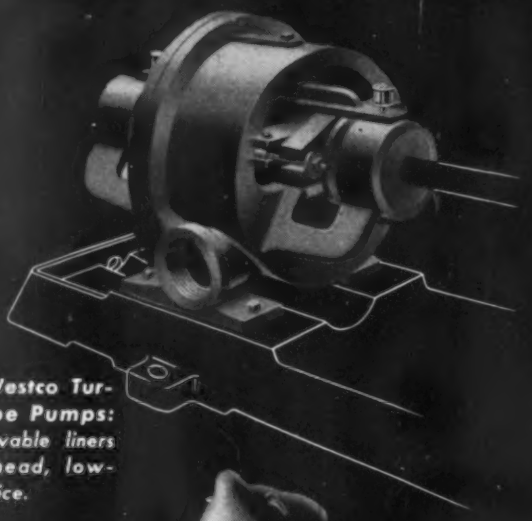
## CENTRILINE CORPORATION

148 CEDAR STREET • NEW YORK 6, N. Y.

***Restores and Protects Pipe-Line Carrying Capacity***

*The Centriline process is a rapid, economical method of reconditioning pipe lines 24" and larger. After cleaning, a thoroughly premixed cement mortar lining of desired thickness is applied centrifugally without rebound. This dense quality product is mechanically trowelled to a smooth finish providing maximum carrying capacity which is permanently sustained. This work is performed underground, in place.*





*Famous Westco Turbine-Type Pumps: with renewable liners for high-head, low-speed service.*

*Fairbanks-Morse-Pomona Vertical Turbine Pumps: Open or closed impellers; oil or water lubricated.*

# Can ANYONE sell a pump?

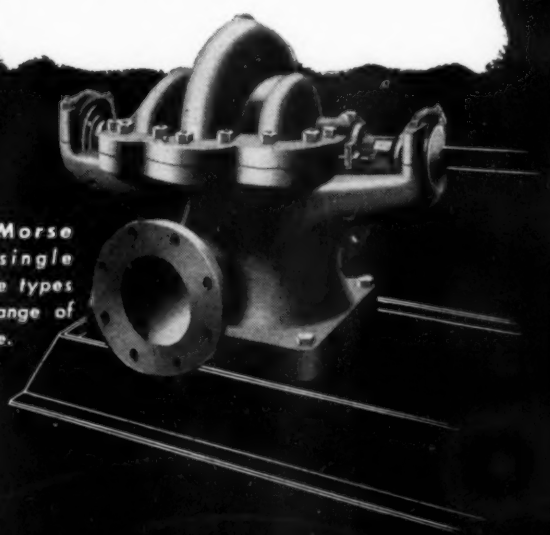
No, just anyone can't sell a pump —properly.

It takes a lot of adroit engineering to figure the right pump for any specific job. It takes a broad background of experience to enable a man to be sure he's selling you a pump that will make you a long-term friend and customer.

This engineering ability and experience are yours when you buy from a Fairbanks-Morse-Pomona dealer.

He *knows* pumps. He has the broadest line to choose from; he's backed by all the engineering and production resources of Fairbanks-Morse. He can offer you skilled, impartial advice—he can sell you the pumping savings and satisfaction you're after.

*Fairbanks-Morse Rotaries: for low-head, low capacity work in all industries.*



*Fairbanks-Morse Centrifugals: single and multi-stage types for broadest range of pumping service.*

**FAIRBANKS-MORSE**

*A name worth remembering*

DIESEL LOCOMOTIVES · DIESEL ENGINES · PUMPS · SCALES · MOTORS · GENERATORS · STOKERS · RAILROAD MOTOR CARS and STANDPIPES · FARM EQUIPMENT · MAGNETOS

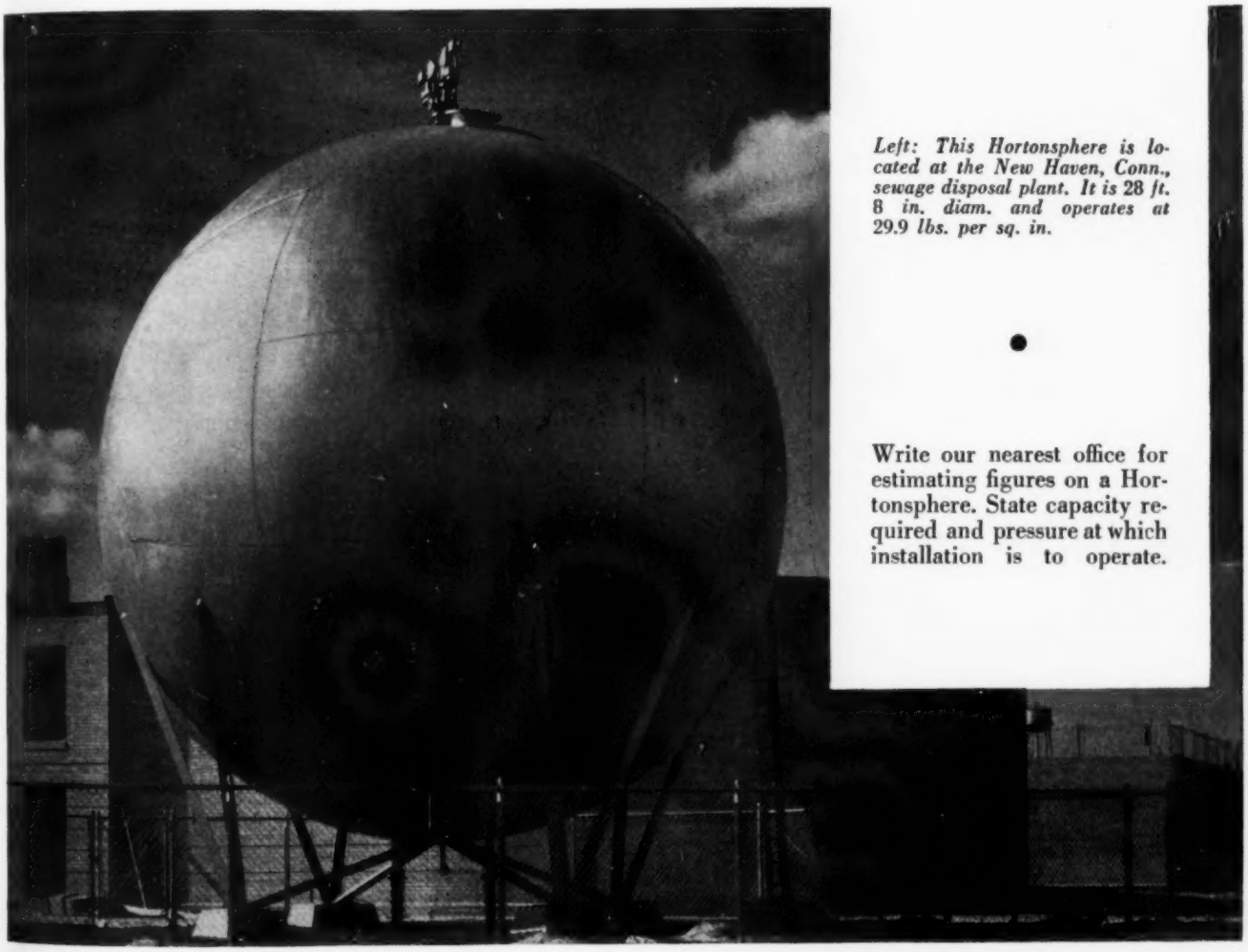
# Plans for Modern Sewage Disposal Plants Include . . .

# the HORTONSPHERE

Facilities for the utilization of sewage plant gas to produce electricity for light, heat and power are a part of well-planned sewage disposal plants. Substantial savings in plant operating costs are reported by municipalities that use digester gas instead of wasting it. To secure maximum benefits from the use of sewage gas, it is necessary to provide storage facilities so that when the gas is not produced in the digesters a steady flow of fuel for the engines can be supplied from storage. This eliminates the need for expensive standby equipment or purchased fuel.

Hortonspheres are the logical gas holders for this service. They are relatively small in size and pleasing in appearance. They have no water seals to require heating or maintenance. Hortonspheres are available in capacities up to 500,000 cu. ft. for pressures from 20 to 100 lbs. per sq. in.

Hortonspheres may be included in designs for new sewage disposal plants or they may be incorporated in your plans when modernizing existing plants. In either case they help reduce the annual operating costs of the plant.



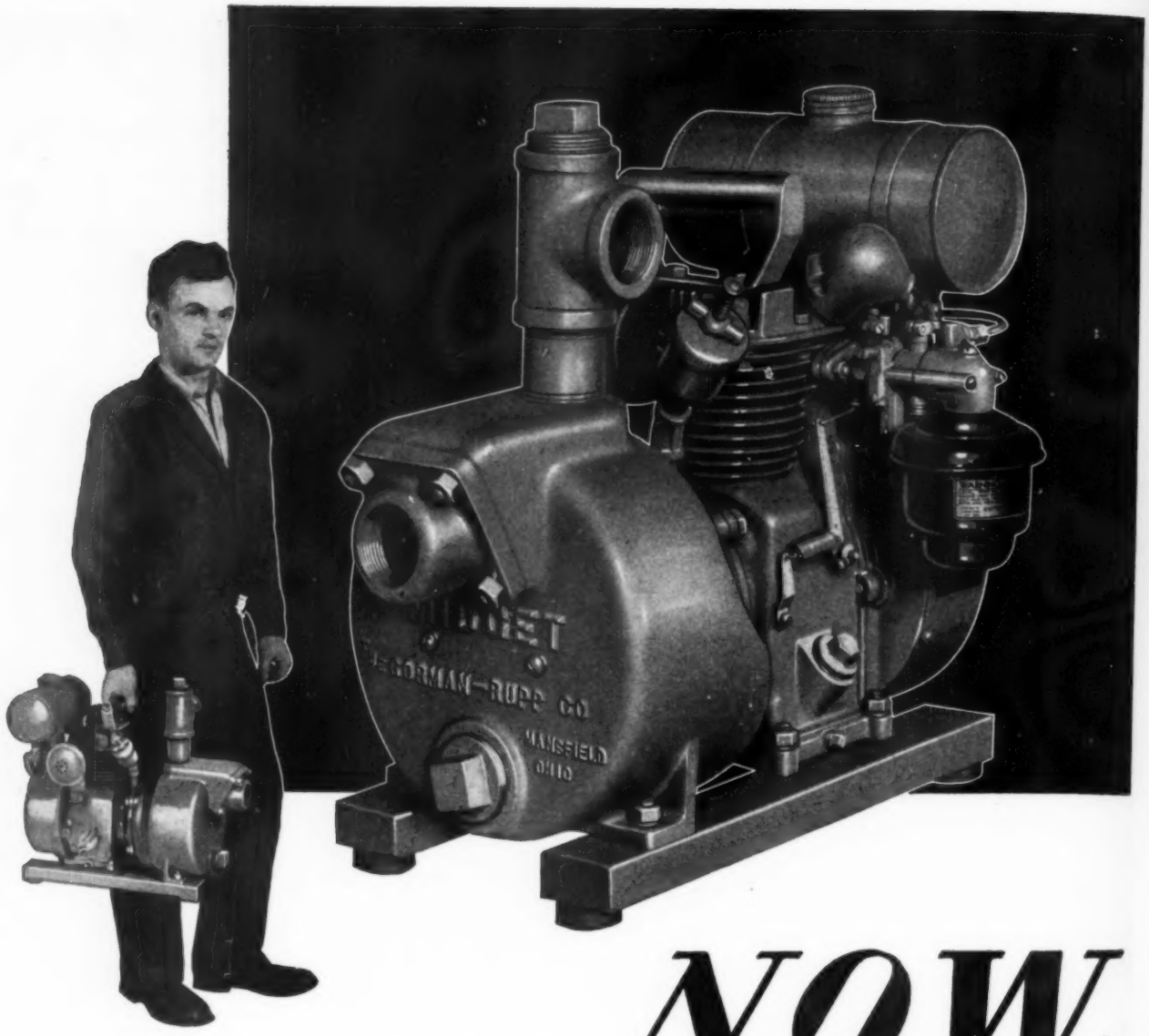
*Left: This Hortonsphere is located at the New Haven, Conn., sewage disposal plant. It is 28 ft. 8 in. diam. and operates at 29.9 lbs. per sq. in.*

Write our nearest office for estimating figures on a Hortonsphere. State capacity required and pressure at which installation is to operate.

## CHICAGO BRIDGE & IRON COMPANY

Chicago 4.....2198 McCormick Bldg.
New York 6.....3390-165 Broadway Bldg.
Cleveland 15.....2262 Guildhall Bldg.
Los Angeles 14.....1455 Wm. Fox Bldg.
Birmingham 1.....1586 North 50th St.
Atlanta 3.....2181 Healey Bldg.
Plants in Birmingham, Chicago and Greenville, Pa.

Tulsa 3.....1646 Hunt Bldg.
Houston 1.....5615 Clinton Dr.
Philadelphia 3.....1644-1700 Walnut Street Bldg.
Havana.....402 Abreu Bldg.
San Francisco 11.....1283-22 Battery Street Bldg.
Detroit 26.....1551 Lafayette Bldg.
In Canada: Horton Steel Works, Limited, Fort Erie, Ont.




# . . . NOW.

## *You can have a pump with your tool kit!*

**The Gorman-Rupp "Midget" is a lot of pump in a very small package. Although it weighs only 60 pounds, it will pump 3000 gallons per hour against a 20 ft. head and will do it for months at a time without attention. The Midget is the smallest of four Gorman-Rupp lightweight pumps. These handy pumps can handle many small drainage jobs and can be quickly and easily transported. They are the toughest little pumps you ever saw and are simple to operate—no valves—fully automatic, self-priming. They are non-clogging—any muck or solids that will pass the intake strainer will clear through the pump.**

**Other Gorman-Rupp centrifugal pumps are made in sizes ranging up to 125,000 gallons per hour capacity.**

**Try a Gorman-Rupp on your next job. If it does not do a better job than any pump you ever saw, you can return it at our expense. Write for further information or contact your distributors.**

*Originators in 1936 of the Famous Blue Pump that others now imitate*

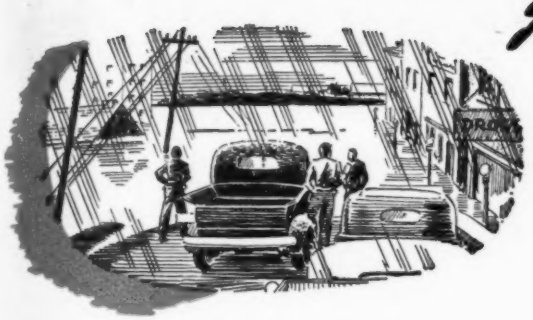
**THE GORMAN-RUPP COMPANY**

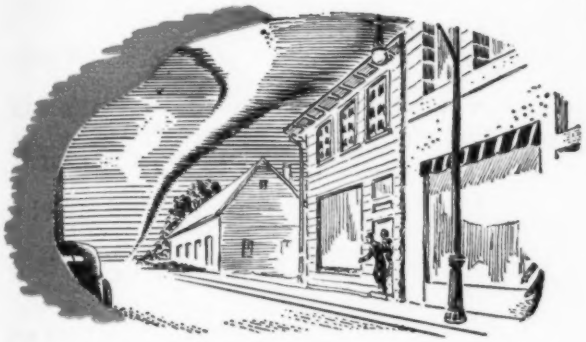
Gorman-Rupp Pumps — Unsurpassed for Pumping Fast

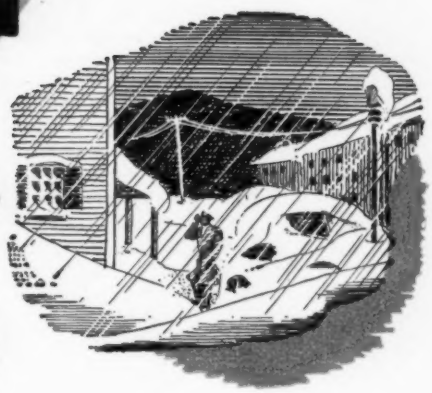
**327 Bowman Street** — **Mansfield, Ohio**

# *Are you prepared*

## FOR THE BIG "IF"







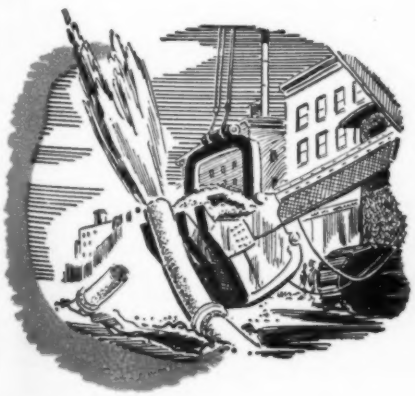
The possibility of explosion, flood, tornado, blizzard, many other emergencies constantly threatens the flow of safe water. That's why so many smart engineers maintain a supply of Per*chlor*on as a standby water treatment chemical. They know that Per*chlor*on has proved itself in every section of the country, by quickly and dependably safeguarding water supplies in a wide variety of emergencies.

Per*chlor*on serves other water treatment functions, too . . . sanitation of small water systems, new mains, wells, swimming pools. Its properties include the oxidation of ferrous iron in water, removal of hydrogen sulphide, control of most types of algae, and the destruction of chlorine-susceptible bacteria. Write us for full descriptive material.

**PENNSYLVANIA SALT MANUFACTURING COMPANY**

1000 Widener Building, Philadelphia 7, Pa.

NEW YORK • CHICAGO • ST. LOUIS • PITTSBURGH • CINCINNATI
WYANDOTTE • TACOMA • PORTLAND, ORE.



PENN SALT

# Perchloron

REG. U. S. PAT. OFF.

# WHY A TON OF PURE WATER

HOW can a ton of water (240 gallons) be collected, processed and delivered to the faucet, for less than a dime?

Because public water supply is a big industry—seven times bigger in tonnage volume than the combined product of all other industries—delivering an indispensable product without a substitute. This is part of the reason but not the big part.

More than half of the capital investment of public water supply systems in this country is in distribution mains, ordinarily financed by bond issues with an average term of 30 years.

If these mains had to be dug up and replaced every 30 years—either because of failure or ruinous maintenance costs—water could *not* be sold for anything like a dime a ton. Bond issues and bond interest, high replacement and maintenance costs, would go on forever, making it impossible to deliver water at low cost.

But over 95% of all the water distribution mains in this country are cast iron mains with a known efficient life of at least 4 times the average term of an issue of water works bonds.

Therefore, cast iron pipe represents the major part of the capital investment in

# CAST IRON PIPE

# COSTS LESS THAN A DIME

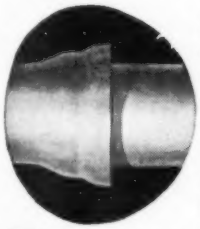
America's public water supply systems. A sound investment from the ground up.

Cast iron mains go on serving for generations after the bonds issued to pay for them are retired and forgotten—saving millions in avoided replacement costs and millions in maintenance.

A big reason why a ton of pure water costs less than a dime is the long life and efficient life of cast iron pipe.

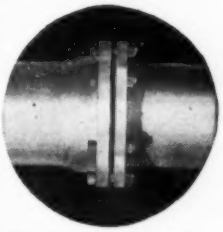
*"Cast iron pipe not only offers a century or more of efficient life as a structure—it offers a century or more of efficient life as a carrier. In the limited areas with tuberculating waters, cement-lined cast iron pipe is tuberculation-proof and insures high carrying capacity for the life of the pipe. In the greatly predominating areas without tuberculating waters, the carrying capacity of unlined cast iron pipe remains practically unimpaired for the life of the pipe."*

## Joints for Cast Iron Pipe



Bell-and-Spigot Joint: the standard joint for water and sewerage service.

A variety of joints are available, of which the two most widely used are illustrated. Special purpose joints, such as the Ball-and-Socket, or Flexible Joint for underwater use, and the Flanged Joint for above-ground use, are also available.



*Mechanical Joint:* bottle-tight and flexible, now with interchangeable parts.

## PUBLIC WATER SUPPLY —the Forgotten Industry

The public takes piped running water for granted—until it's turned off. A good public water supply is never news—except on the rare occasion when something goes wrong. To help create public awareness of the service rendered by America's water supply systems, the Cast Iron Pipe Research Association is presenting little known facts about public water supply to the *six million* influential readers of "Time" and "Nation's Business." For example, the following illustration and excerpts from a current advertisement:

### what price water?

Cut off the water supply of this country for one week—and water would be more precious than diamonds. Water supply systems are the most vital of all public utilities. Prolonged interruptions to other public utilities would be serious. Prolonged interruption to the public water supply would be a catastrophe. There is no substitue for water!

Be appreciative of the efficient but little publicized service you receive from your community water supply system. The cost is small but the service is indispensable.

• • •

*There is no substitute that approximates the long life and economy of cast iron pipe, the standard material for water distribution mains for over a century.*

Cast Iron Pipe Research Association, T. F. Wolfe, Research Engineer, Peoples Gas Bldg., Chicago 3.

# SERVES FOR CENTURIES

# "Dad...what was garbage?"

THE CHILDREN of tomorrow might well ask that question.

Even today—in many homes—"garbage" has ceased to be a household word. In these homes in more than 300 communities, the garbage can is disappearing. The breeding ground of germs is gradually being narrowed!

How is this step to healthier, more sanitary living being achieved?

Through the adoption of a revolutionary invention—a kitchen unit that shreds food waste and flushes it into the sewer before it has a chance to become garbage. Yes, the General Electric Disposall* is the instrument for eliminating garbage, but it is the co-operation of far-sighted sanitation experts who make its use possible.

In many instances, these public health officials have revised archaic sanitary codes to permit the installation and use of Disposalls in their communities' homes!

It is men like these—men who have dedicated their profession to a cleaner, healthier community life—who will be remembered as the pioneers of a garbage-free

America. Their contribution to progress will be as important as that of the sanitary engineers of another day —those who helped to combat epidemics, such as typhoid, by eliminating the outhouse!

We believe that once you know all the facts about the Disposall method—its economy as well as its efficiency —that you will want to join today's crusade against filth and infection. You, too, will want to help make "garbage" a forgotten word in America!

## ANSWERING YOUR QUESTIONS ABOUT THE DISPOSALL METHOD OF ELIMINATING GARBAGE

### 1. "Why should food waste be instantly removed?"

Because, like human waste, food waste is organic matter —odorous and putrefactive. Attracting germ-spreading flies and rodents, it is a dangerous source of infection.

No less a threat to community health than was the outhouse, the garbage can should be as completely eliminated. The Disposall method can mean a garbage-free community!

### 2. "Has the Disposall method been adequately tested?"

Yes! Disposalls have been installed in more than 300 communities. Their efficiency in actual use, plus extensive laboratory testing for more than ten years, has proved Disposalls to be 100 per-cent efficient in the removal of food waste.

### 3. "Is there any danger of sewer stoppages?"

No! The Disposall shreds food wastes into such fine particles that they flow freely through the pipe lines without shoaling or settling.

Although similar to human wastes and other solids now flowing through your lines, Disposall processed food wastes are smaller, more water-buoyant and uniform in character. These wastes are ground in a controlled amount of cold water, which congeals and homogenizes greases into a form which will not clog sewer lines.

### 4. "Will I have to expand my plant's capacity?"

Not for many years will the number of Disposalls in your community become large enough to add appreciably to the loading on the treatment plant. Even if every home in your community used a Disposall, the volume of sewage flow would be increased by *less than two per cent.*

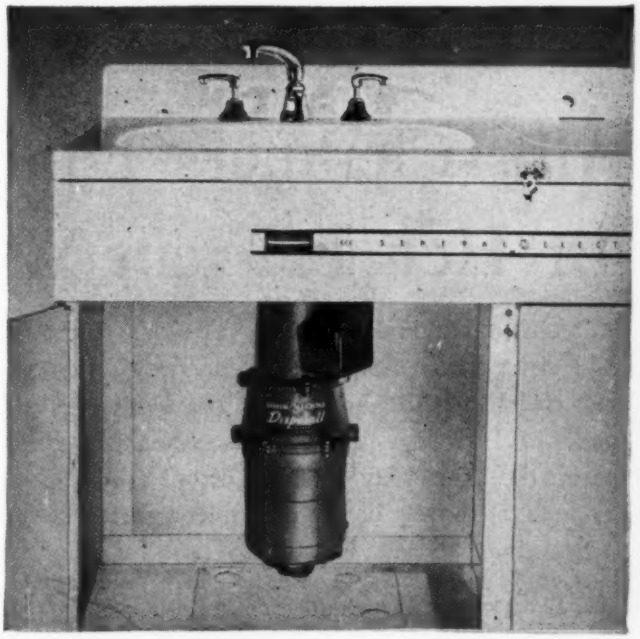
The addition of food wastes to the sewage flow will naturally increase solids and organic loading on the plant. But many plants will be able to handle this increased loading for some time; others can be expanded when necessary.

### 5. "Are sewage treatment plants necessary?"

Whether or not Disposalls are used, we believe that every community should have a sewage treatment plant. The Disposall method accentuates the need for these plants. They are needed! They provide a vital safeguard for public health!

### 6. "How can I get more information?"

Further information about Disposalls—and the Disposall method—is yours for the asking. We shall be glad to send complete information, to answer any specific questions you may want to ask. Please write to Department SWE 846, General Electric Company, Bridgeport 2, Connecticut.



**The General Electric DISPOSALL** shown installed in our Electric Sink. Food wastes are scraped into drain opening and safety cover is placed in position. Cold water tap is then turned on, starting the DISPOSALL operation. Food waste is shredded and flushed away automatically.

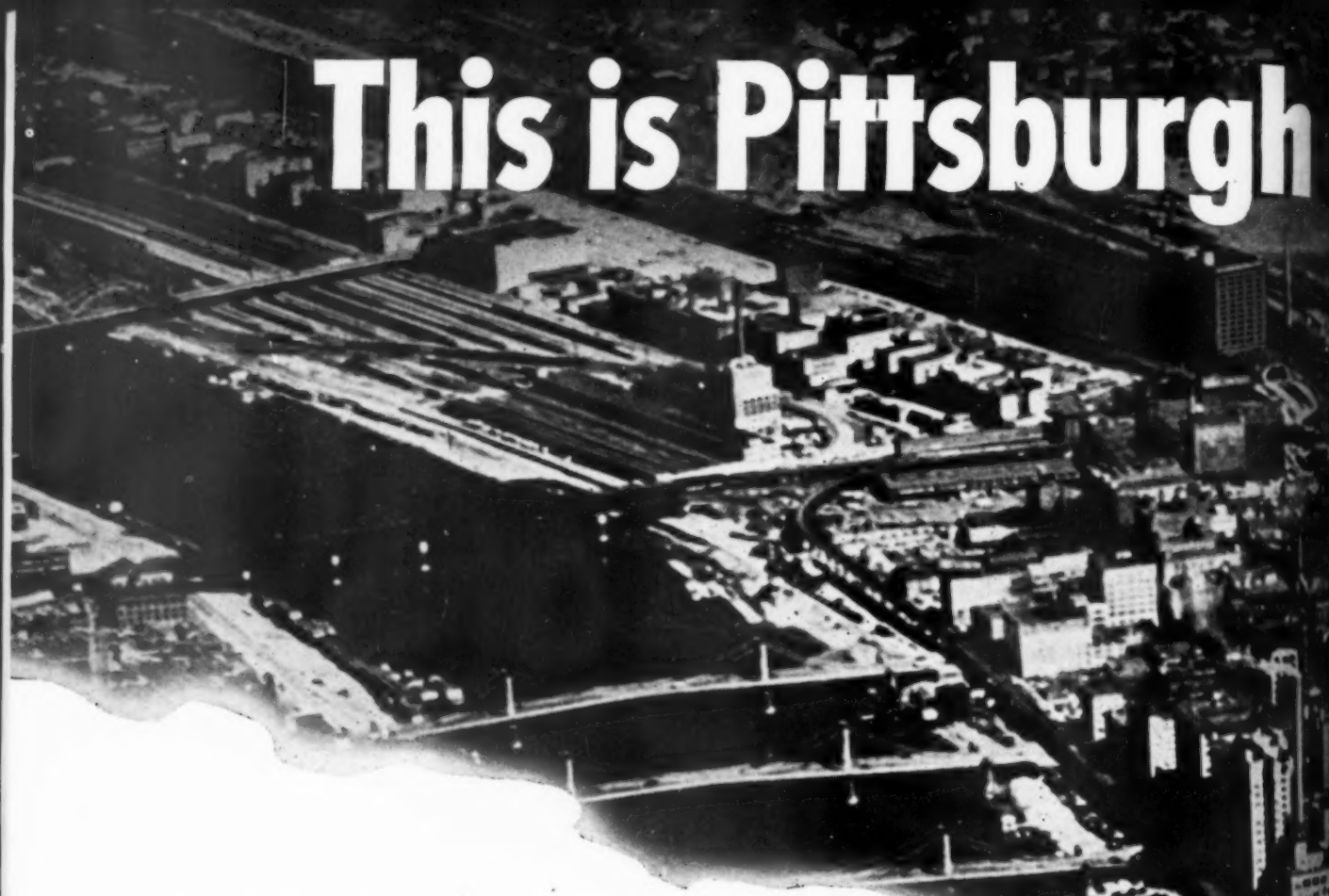
Disposall

*TRADE-MARK REG. U. S. PAT. OFF.

*CONVERTS FOOD WASTE TO SEWAGE—ELIMINATES "GARBAGE"*

GENERAL ELECTRIC

# This is Pittsburgh



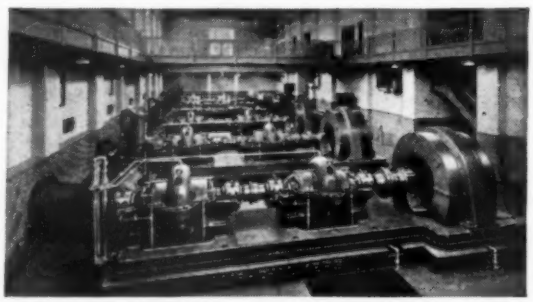
## Allis-Chalmers Equipment Used In Her Efficient Water System

ONCE THE HISTORIC GATEWAY to the West, Pittsburgh today is the heart from which flows the life-blood of American Industry — iron, steel and coal. Her rivers, the Allegheny, Ohio and Monongahela, carry more traffic than the Panama Canal. Colleges, universities, centers of art and research have earned for Pittsburgh the title, "City of Art, Culture and Education". And far from the Golden Triangle are lovely homes and quiet streets . . . this, too, is Pittsburgh.

* * *

Pittsburgh's Brilliant Pumping Station, in operation 15 years, is an excellent example of A-C engineering. It is *typical* of the kind of engineering provided by A-C for small, medium or large cities. Equipment problems — motors, control, turbines, blowers, pumps, screens — will find ready solutions at A-C. *For today Allis-Chalmers leads the world in its range of municipal equipment.* For prompt help, call your nearest A-C office or write to ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN.

A 2207



BRILLIANT PUMP STATION . . . Allis-Chalmers synchronous motors drive A-C pumps connected in series.

Turbines . . . other power generation equipment.

Transformers — all types and sizes 1½ kva and up.

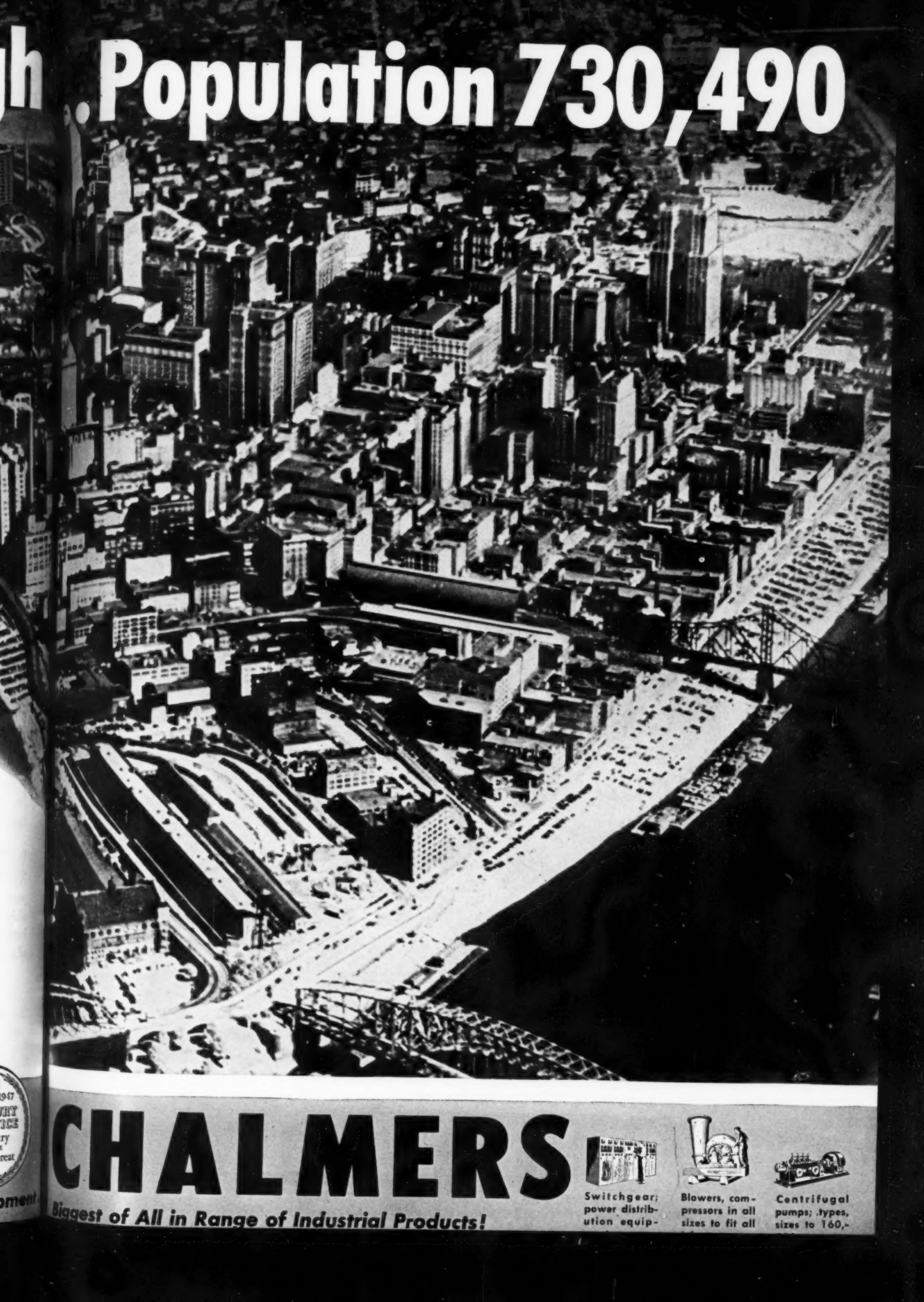
Unit substations — available in any practical size.

Motors 1 hp and up; controls; V-belt drives.

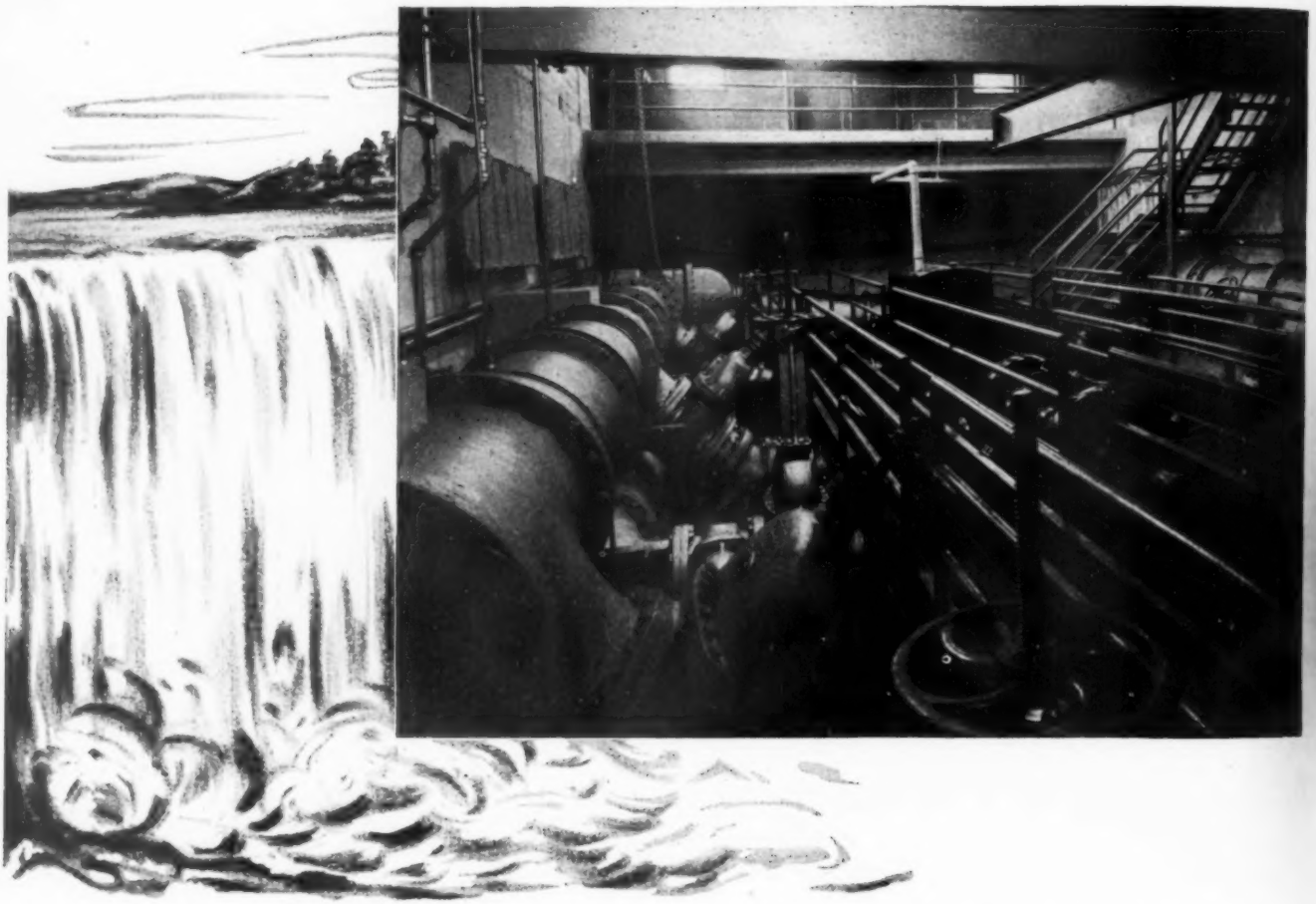
# ALLIS

**One of the Big 3 in Electric Power Equipment**

1847 1947
A CENTURY OF SERVICE to Industry THAT MADE America Great


. Population 730,490
CHALMERS
Biggest of All in Range of Industrial Products!
Switchgear; power distribution equip-
Blowers, compressors in all sizes to fit all
Centrifugal pumps; types, sizes to 160,-

# *Water over the Dam...*



## *controlled by* LUDLOW!

This interior view of the Waterbury Control Station at Morris, Connecticut, shows one part of the battery of LUDLOW Double Disc Gate Valves that regulates Morris Dam and Wigwam Reservoir. Familiar stand-bys, they provide the smooth, accurate control that has marked LUDLOW performance since 1866 — a fact well appreciated by thousands of other communities in all parts of the country.

LUDLOW engineers will be glad to talk with you about your plans for replacements or new installations. There's no obligation.

V-71

The LUDLOW VALVE MFG·CO·INC·TROY·N·Y·

SINCE 1866

# making the grade . . .

DELIVERING THE GOODS day after day is a challenge to an industry's skill, experience, and capacity . . . and American railroading symbolizes for industry at large a distinguished performance standard. The "High Iron" pioneered our Nation's economic expansion and industrialization. So, too, have "key" industries in many fields opened the way to the realization of our Nation's productive capacity and raw material self-sufficiency. First in America to produce basic electro-chemicals . . . caustic potash, carbonated potash, and liquid chlorine . . . Niagara has introduced their use into many important industrial processes. Today Niagara continues to pioneer the use of these materials, while maintaining the modern standards of production necessary to extending a front ranking source of supply for electro-chemicals.

Niagara Alkali Company, 60 East 42nd Street, New York 17, N. Y.

**THE PIONEER CREED**

*Always New, Always Better*

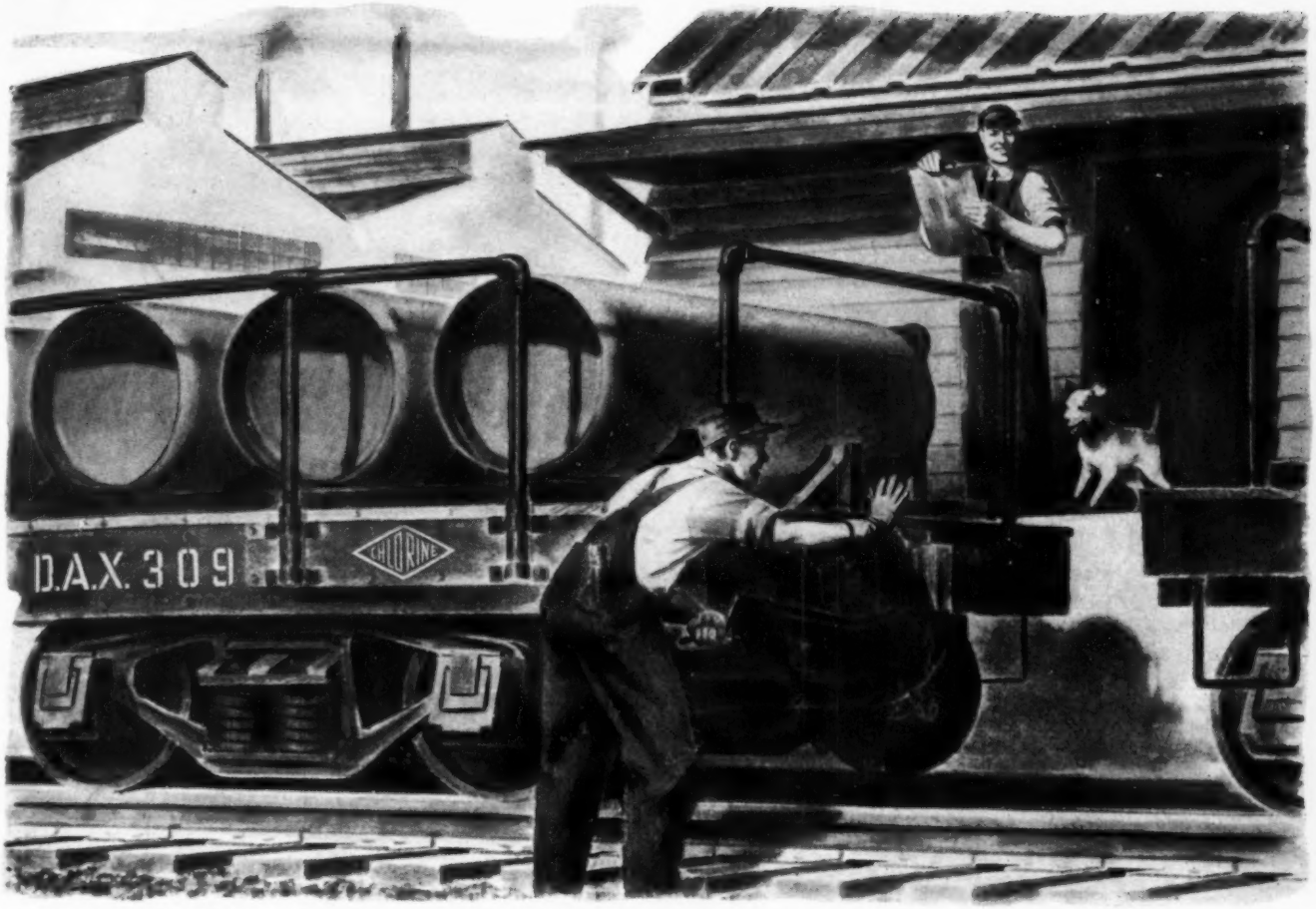
Since the turn of the century Niagara has pioneered basic electro-chemical development in this country. This experience is reflected not only in Niagara product quality but also in the efficiency of the service that Niagara extends to customers seeking to blaze new trails to product improvement.

AN ESSENTIAL PART OF AMERICA'S GREAT CHEMICAL ENTERPRISE

*Niagara Alkali Company*

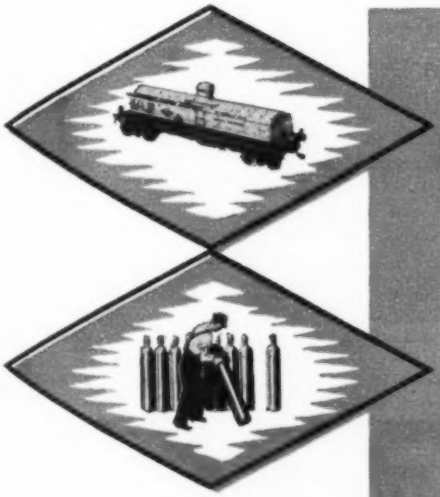
CAUSTIC POTASH • CAUSTIC SODA
CARBONATE OF POTASH

LIQUID CHLORINE • NIAGATHAL
PARADICHLOROBENZENE




# DIAMOND *Liquid* CHLORINE

## Supplied in multi-unit cars,



tank cars, or

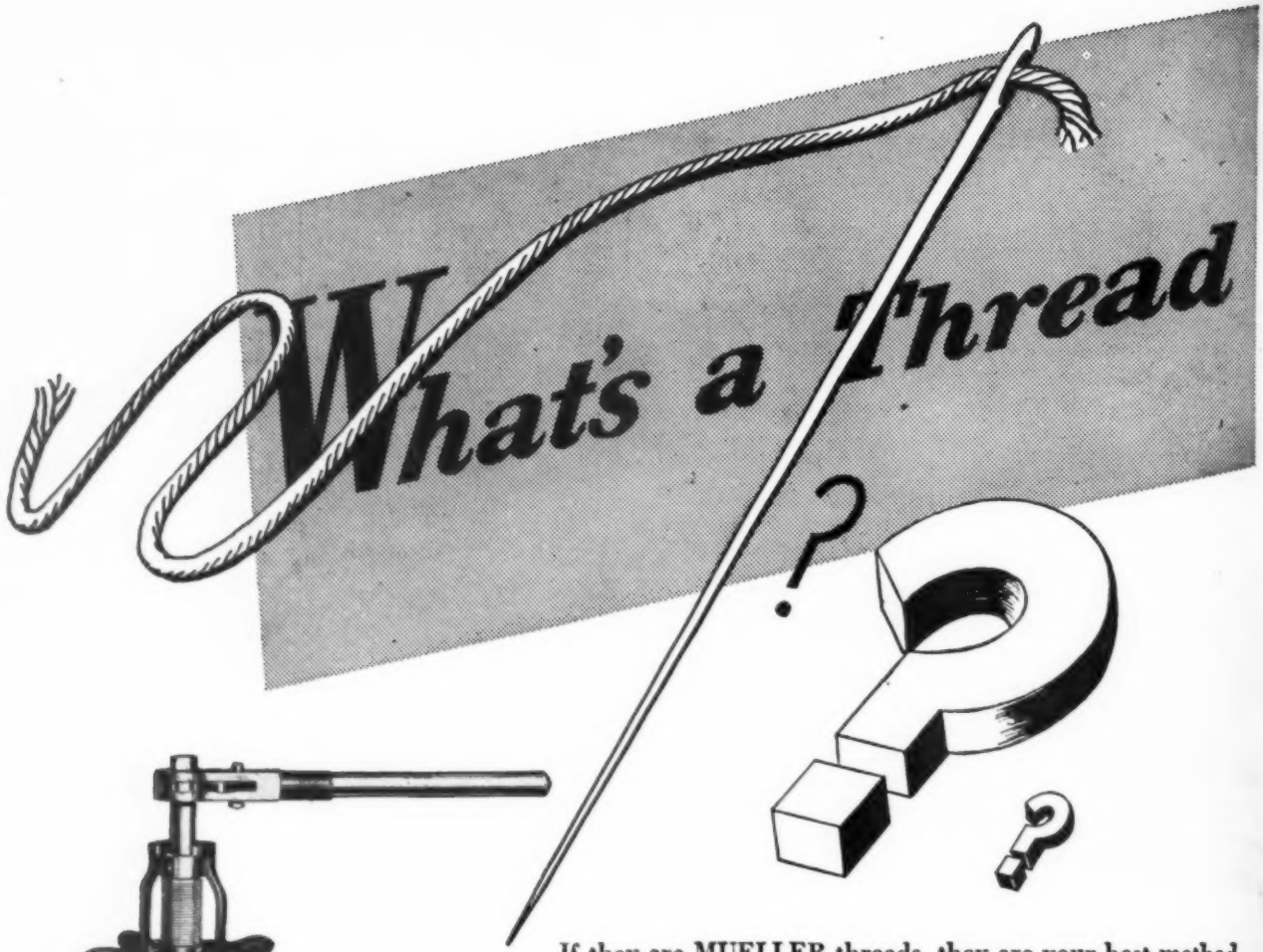
cylinders as required, on

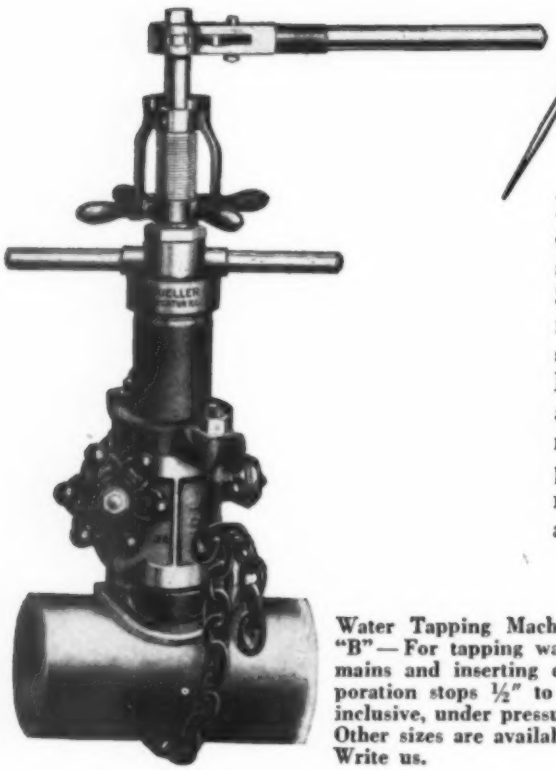
a scheduled delivery basis

**DIAMOND ALKALI COMPANY**

PITTSBURGH 22, PA., and Everywhere

# What's a Thread

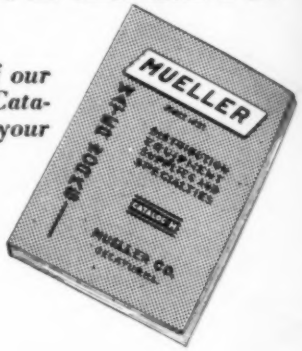




Water Tapping Machine "B"—For tapping water mains and inserting corporation stops ½" to 1" inclusive, under pressure. Other sizes are available. Write us.

If they are MUELLER threads, they are your best method of securing accurate alignment and tight joints when inserting Corporation Stops. Each MUELLER Corporation Stop has sharp, deep and clean-cut threads for easy running in the tap. They have the right chamfer for easy starting and the proper taper to run up to a tight fit with less danger of splitting the main. Mueller combined Drills and Taps when used with MUELLER Tapping Machines, not only cut threads in the main that fit MUELLER Stops perfectly, but they also accurately align the Stop to the main, making an installation that no other method can approach.

*Do you have a copy of our "H" Water Works Catalog? If not, write for your copy today.*



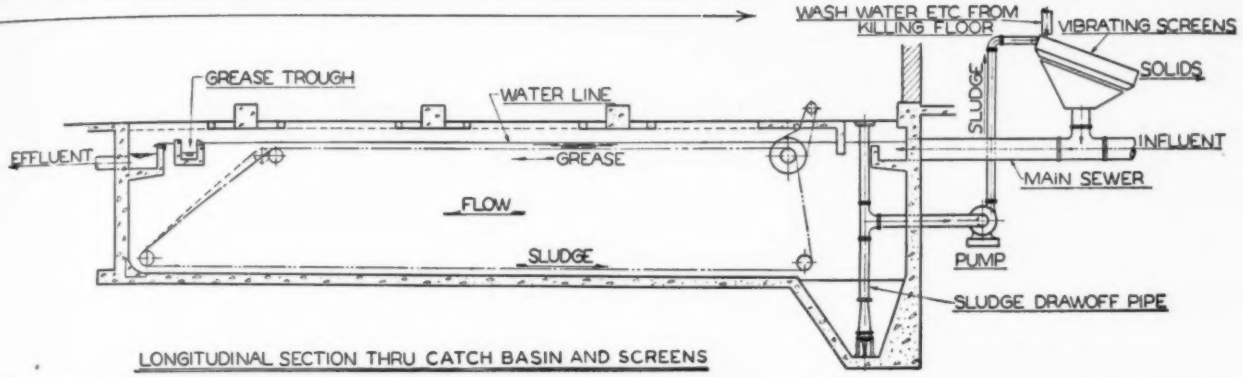

DEPENDABLE SINCE 1857 FULLY WARRANTED OUR 90th YEAR

# MUELLER CO.

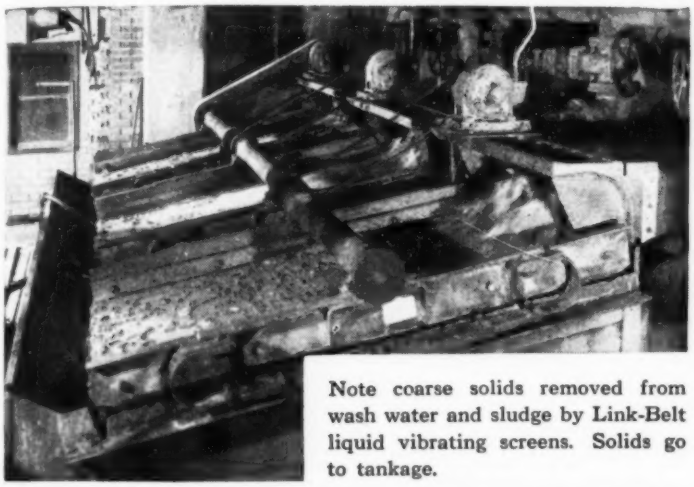
MAIN OFFICE AND FACTORY ..... DECATUR, ILLINOIS

OTHER FACTORIES: *Los Angeles, Cal.; Chattanooga, Tenn.; Sarnia, Ont. Canada*

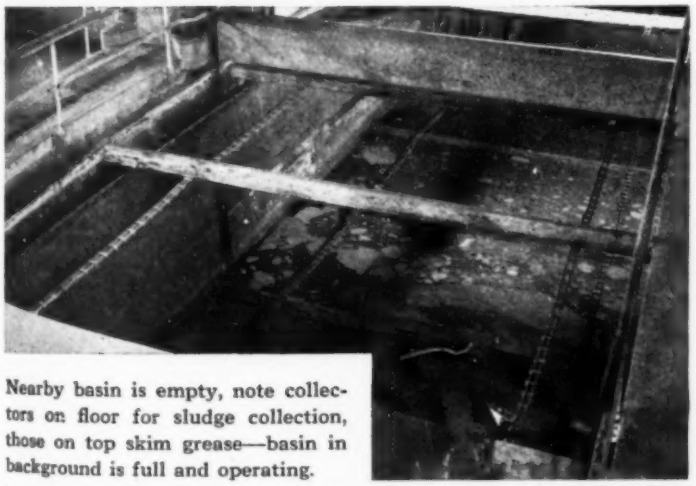
# RECOVERING VALUABLE GREASE *with* LINK-BELT *Screens and Collectors*




LONGITUDINAL SECTION THRU CATCH BASIN AND SCREENS



Note coarse solids removed from wash water and sludge by Link-Belt liquid vibrating screens. Solids go to tankage.



Nearby basin is empty, note collectors on floor for sludge collection, those on top skim grease—basin in background is full and operating.

A large mid-west packing plant recovers valuable grease and solids, and avoids stream pollution by the use of the system diagramed above and illustrated at the left. Wash water from killing and dressing floors passes through Link-Belt liquid vibrating screens, removing coarser solids which go to tankage. The water is then pumped to the catch basins equipped with Link-Belt Straightline Collectors, where fat coming to the surface is skimmed off by the slow moving Collectors as they move along on the surface. Returning along the bottom of the basin, the same collectors carry the settled sludge to a hopper at the other end of the basin. The sludge is pumped to the vibrating screens for further solids removal.

By this means, valuable grease which would otherwise be lost, is recovered at a low cost, waste disposal is simplified and the load on the municipal sewage treatment plant lessened.

Link-Belt engineers are cooperating with consulting, municipal and sanitary engineers and plant operators in equipping sewage treatment and water purification plants for positive results and highest efficiency.

**LINK-BELT COMPANY**

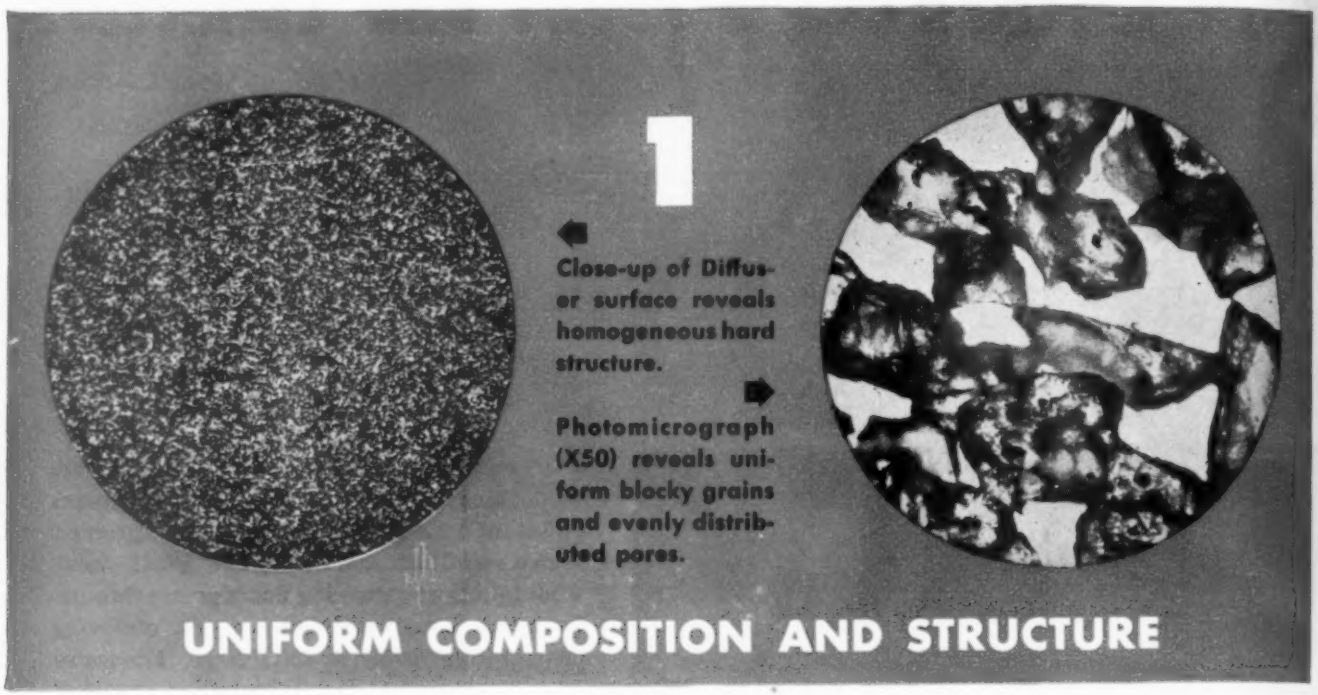
Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices in Principal Cities. 10,665-B

Link-Belt products for sewage and industrial waste water treatment and water purification plants include — Straightline Sludge Collectors, Vibrating Screens, Mixers for Flocculation Tanks, Bar Screens, Tritor Screens, Straightline Grit Collectors and Washers, Heat Dryers, Straightline Scum Breakers for Digestion Tanks, Elevated Diffusers for degreasing, aeration and mixing of liquids, Non-Clogging Spray Nozzles, Traveling Water Intake Screens, Rotary Screens, Coal and Ashes Handling Machinery, Car Spotters and Haulage Systems, Shovels-Cranes-Draglines and a complete line of Elevating, Conveying and Power Transmission Equipment.

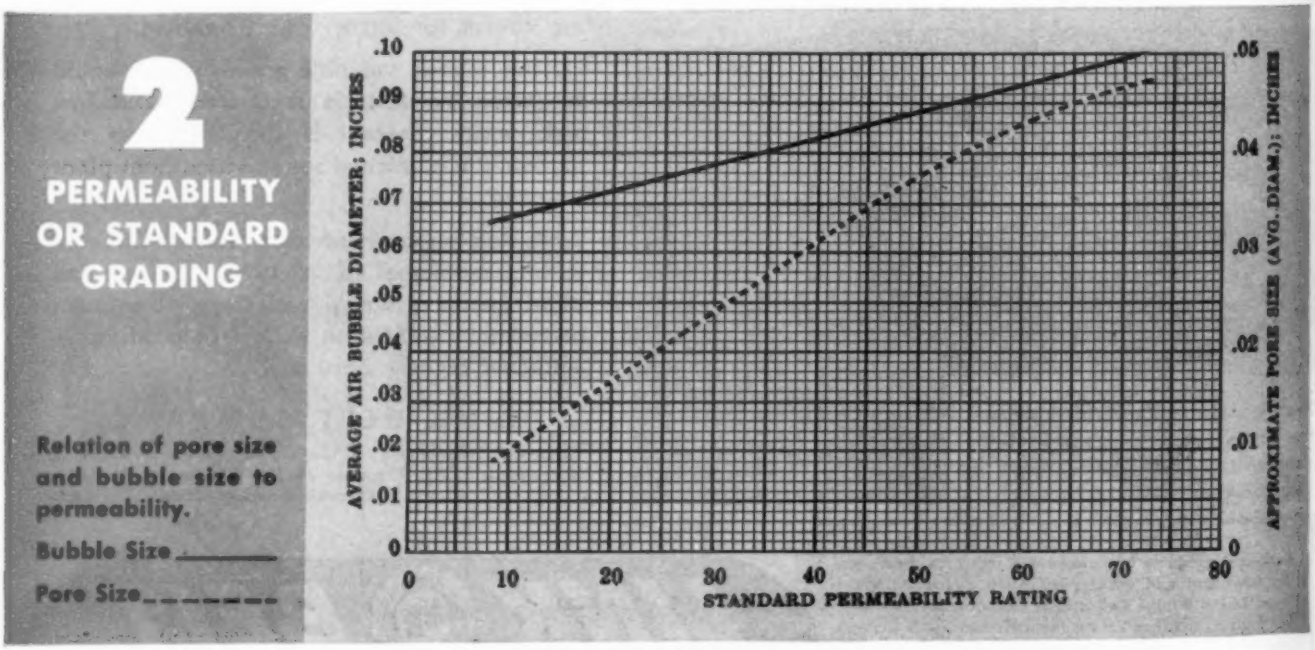
**LINK-BELT CONVEYORS**

PREPARATION EQUIPMENT . . . POWER TRANSMISSION MACHINERY

# *Here's what you want in* DIFFUSER MEDIA


1
Close-up of Diffuser surface reveals homogeneous hard structure.
Photomicrograph (X50) reveals uniform blocky grains and evenly distributed pores.
UNIFORM COMPOSITION AND STRUCTURE

Made from selected sizes and shapes of grain which is bonded, molded and vitrified, ALOXITE electrically fused aluminum oxide Diffuser Media present a hard, homogeneous structure. Under the microscope uniform, blocky, angular-edged grain and evenly distributed pores are revealed. The unique surface structure speeds release of small air bubbles because their surface tension is less. A high ratio of pores to total volume minimizes clogging. Low resistance to air passage is achieved through connected pores between smooth bond-covered grains. This stable and durable structure of ALOXITE Diffusers resists all ordinary acids and corrosive agents encountered in sewage and water treatment. Temperature changes and physical or mechanical stresses found in such applications do not bother these Diffusers.



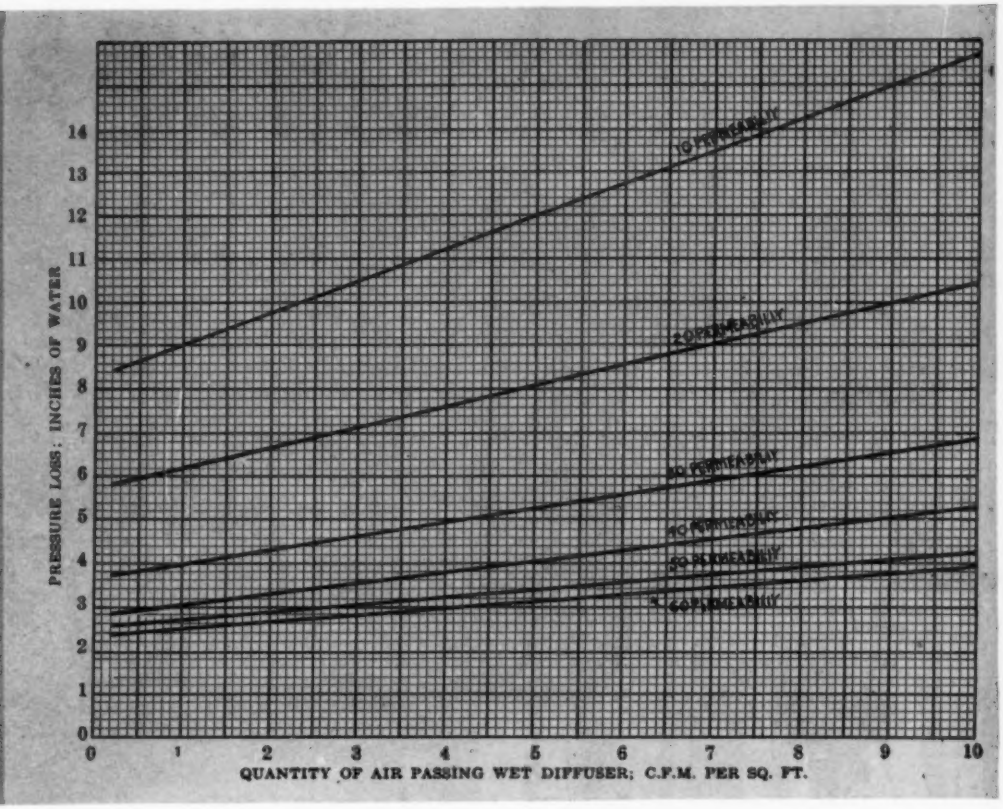

Efficient operation of any diffuser media installation depends on utilizing many individual units of similar grain size and pore structure. The standard grading of diffusers is called permeability.

Permeability is most directly related to the size of pores provided by the size of grain used. Because diffusion of small bubbles means more efficient aeration, porous diffusers provide three times the efficiency of perforated pipe. ALOXITE Porous Media diffuse the smallest possible bubbles at any given permeability rating.

Permeability tests pioneered by The Carborundum Company assure economy of operation at low cost by insuring uniform diffusion throughout the tank.

# 3 PRESSURE LOSS

Low pressure loss through submerged Diffusers of various permeability ratings.



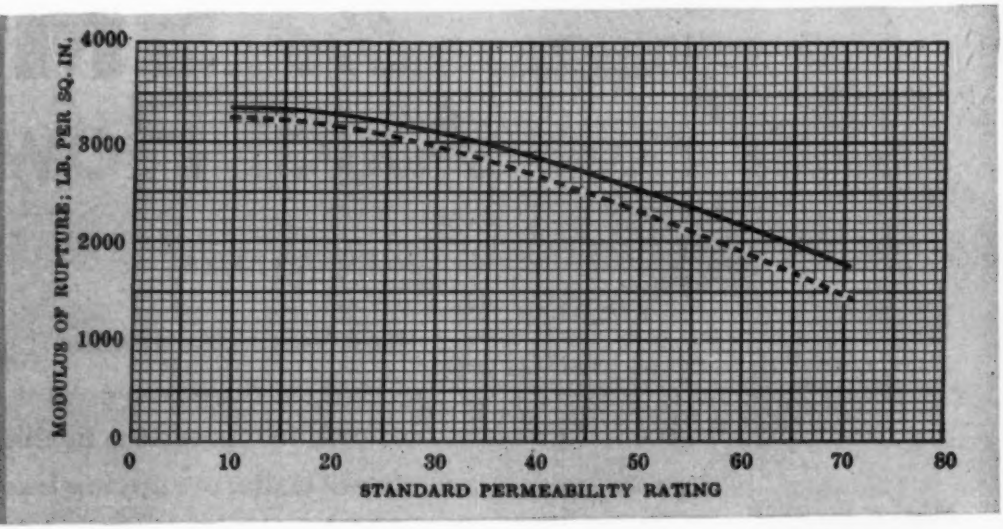

Low resistance of submerged diffusers results in substantial cumulative savings in power costs over a period of use. At any permeability rating, ALOXITE Diffusers have low pressure loss at any given rate of air diffusion. Small size of bubbles is not sacrificed.

# 4 STRENGTH FOR SAFETY

Relation of strength to permeability.

Dry_____

Saturated____




Uniformly supported ALOXITE Diffuser Plates support a 20 ft. column of sewage or water with a safety factor of 5 or more. Because most stresses are incurred during installation or accidentally, a test load of 1,000 lbs. is applied to the center line of each plate while it is supported only at each parallel edge. The high modulus of rupture is shown here.

For experienced advice, data or assistance, write Dept. **O-47,** The Carborundum Company, Refractories Division, Perth Amboy, New Jersey.

# DIFFUSER MEDIA

## BY CARBORUNDUM

TRADE MARK

*"Carborundum" and "Aloxite" are registered trademarks which indicate manufacture by The Carborundum Company*

# *the* SMITH Axial Flow Pump

**NEW VALUE!**

**Now you can obtain Pumps with Fixed or Adjustable Vane Impellers, affording greater flexibility, with fewer units, occupying less space, and which may be directly driven by electric motors, Diesel, gas, or gasoline engines.**

**Write for Bulletin No. 148.**

*If It's Hydraulics-Put It Up to Us.*

## S. MORGAN SMITH Co.

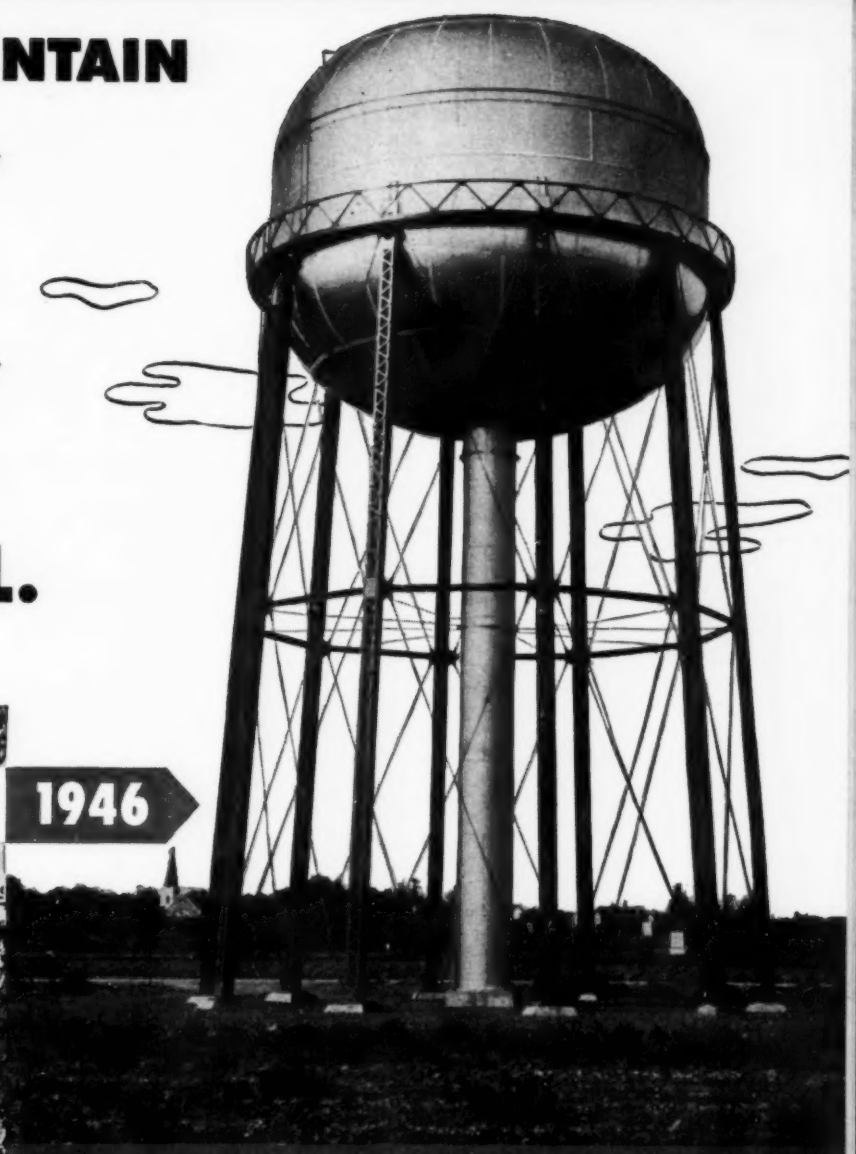
YORK, PENNA. U.S.A.

# HELPING TO MAINTAIN

# *Better Water Service*

## IN FAST-GROWING

# STOCKTON, CAL.



## ELEVATED STEEL TANKS
## by
## PITTSBURGH
## ·DES MOINES

With an excellent service record established by its original Pittsburgh-Des Moines Elevated Steel Tank installed six years ago, the California Water Service Company at Stockton, California, has recently added a second P-DM tank to serve the northern section of the city, where it has been successful in maintaining a more uniform pressure than was formerly available. With a wide-ranging water system, Stockton takes its water supply from a number of deep wells located at pumping stations in various points throughout the distribution system. These Pittsburgh-Des Moines Elevated Steel Tanks do their full share in lowering pumping costs and aiding in the equalizing of water pressures around the clock.

For a detailed consultation on the better water storage needs of your own community, write—without obligation of any kind.

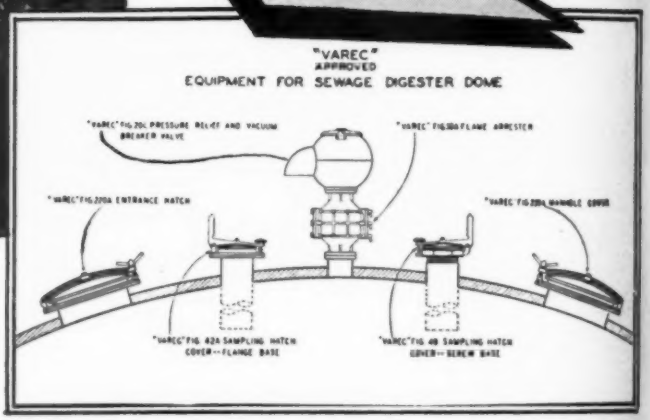
**PITTSBURGH · DES MOINES STEEL CO.**

PITTSBURGH, PA., 3418 NEVILLE ISLAND—DES MOINES, IOWA, 919 TUTTLE STREET
NEW YORK, ROOM 918, 270 BROADWAY · CHICAGO, 1222 FIRST NATIONAL BANK BUILDING
DALLAS, 1223 PRAETORIAN BUILDING · SAN FRANCISCO, 625 RIALTO BUILDING
SEATTLE, 526 FIRST AVENUE, SOUTH

THE PACE SETTER SINCE 1928

# DIGESTION WITHOUT EXPLOSION!

PROPER SEWAGE GAS CONTROL with "VAREC" approved EQUIPMENT




Exaggerated view for illustration purposes only. "Varec" Approved Equipment for Sewage Digester Dome—each of these items are noncorrosive, nonsparking, easy to install and foolproof in operation. Check Catalog S-3 for the sizes needed for your requirements as well as other safety equipment.

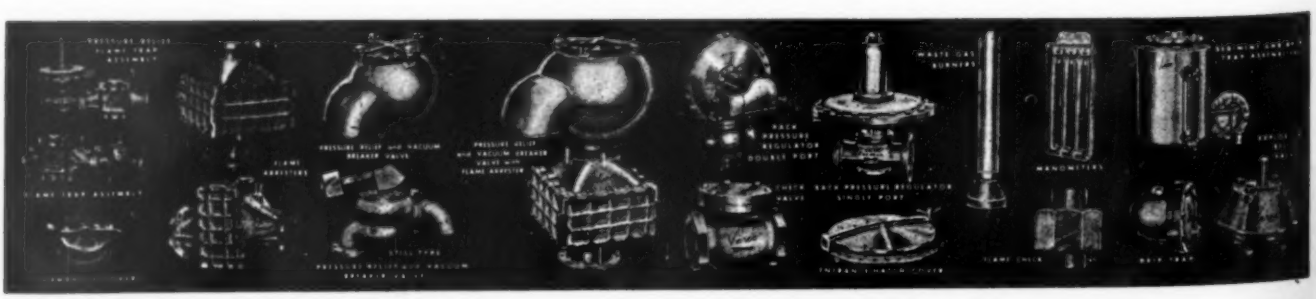
GAS given off during digestion is generally 60 to 78% methane, which is explosive when mixed with between 8 to 19 times its volume of air. Hydrogen Sulphide is usually present in sufficient quantities to cause still greater hazards. Explosive mixtures in the tops of sewage digesters can and have resulted in dangerous explosions. But if proper precautions in handling these gases are observed there need be no hazard about digestion plants.

The Vapor Recovery Systems Company manufactures approved gas control equipment that is known throughout the Sewage Industry for its safe and excellent design and workmanship. Rigid laboratory inspections and tests are made on all "Varec" equipment to insure long trouble-free operation. If gas control is among your problems let "Varec" engineers assist you.

**THE VAPOR RECOVERY SYSTEMS COMPANY**
**Compton, California, U.S.A.**

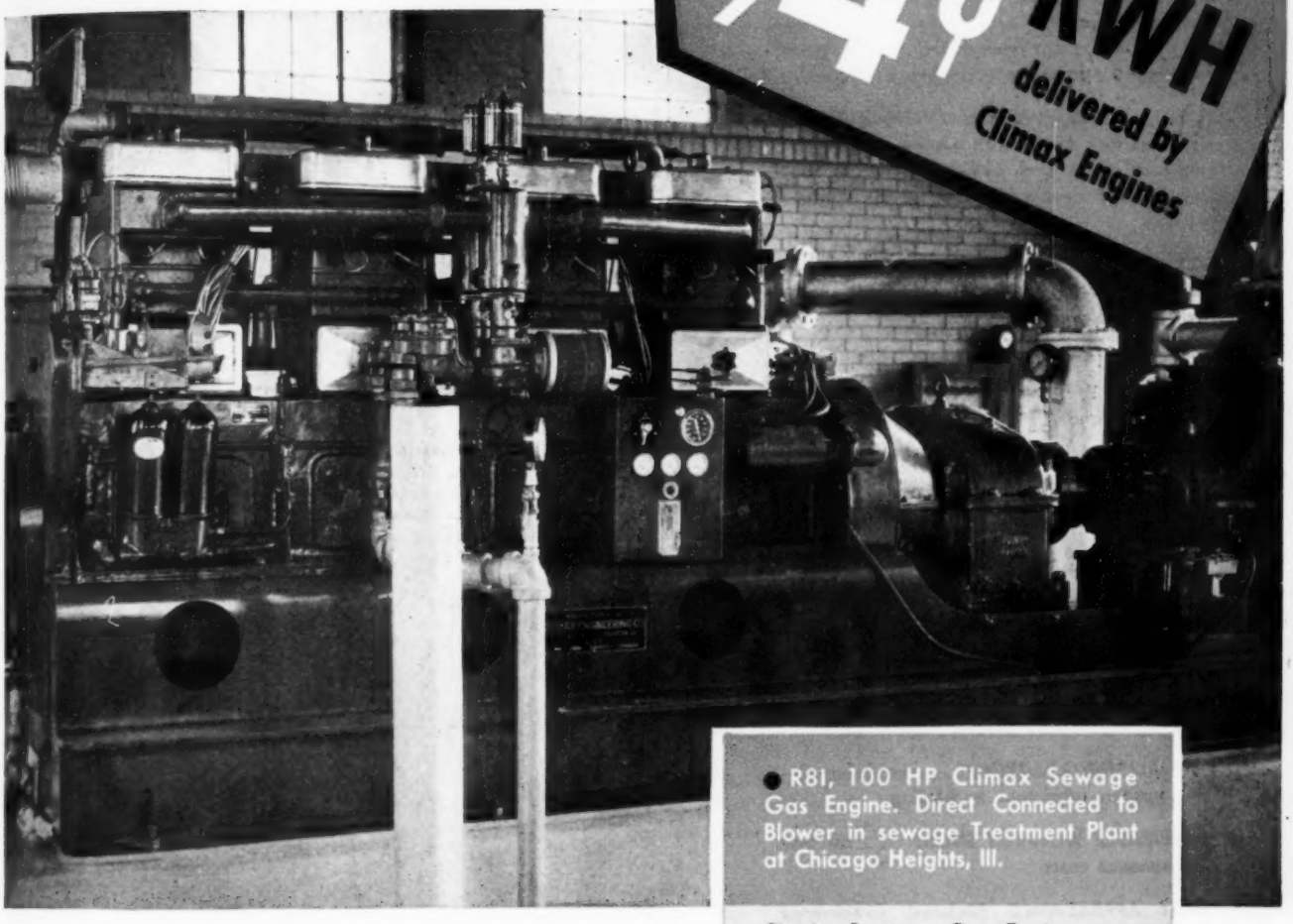
New York City • Chicago, Illinois • Cleveland, Ohio • Houston, Texas
Agencies Everywhere — Cable Address "VAREC COMPTON" — All Codes

**The Pace Setter Since 1928**



# POWER FROM COST-FREE SLUDGE GAS

1/4¢ PER KWH delivered by Climax Engines



● R81, 100 HP Climax Sewage Gas Engine. Direct Connected to Blower in sewage Treatment Plant at Chicago Heights, Ill.

**Climax Engines operating on sludge gas operate sewage pumps, blowers and generators (available records of many sewage treatment plants show), at a power cost equivalent to $0.0025 (¼ cent) per kwh.**

It can be guaranteed that the sludge gas used to operate Climax Engines for a population of 100,000 can have a cash value of $17,000 a year.

Savings thus effected by operation on by-product gas are supplemented by 50% heat recovery from jacket water and exhaust gas—usually more than is needed to heat digesters and buildings.

For complete information, bulletins or engineering consultation, write Climax Engineering Division, Climax Industries, Inc., Clinton, Iowa.

Climax Sewage Gas Engines are 4, 6, 8 and 12 cylinder, 4 cycle types, rated from 40 to 205 h.p. Climax standby generating sets from 5 kw to 250 kw.

climax BLUE STREAK ENGINE

Builder of Climax DIESELS and GENERATING SETS

CLIMAX INDUSTRIES INC.

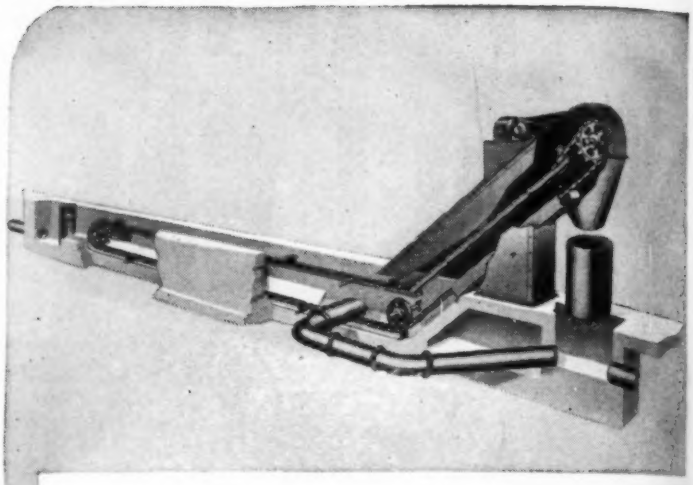
# YOU'RE AHEAD 10 WAYS . . .

## with Rex Grit Equipment!

If you want efficient, economical, reliable performance from grit equipment, rely on Rex. For only Rex gives you these 10 important advantages:

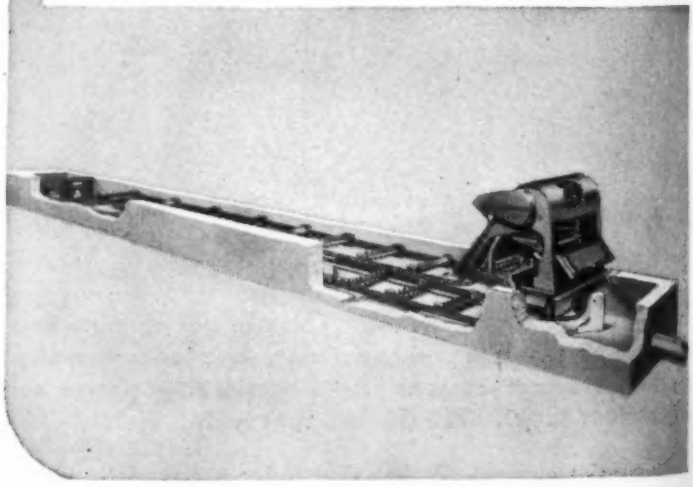
1. ***EXPERIENCE.*** *Rex has the knowledge gained from more than 100 units in service providing the experience and background necessary for handling new problems promptly and efficiently.*
2. ***LONG LIFE—MINIMUM MAINTENANCE.*** *The exclusive Rex design with quality materials of generous sizes and built-in safety factors, assures long service life with minimum maintenance.*
3. ***SIZE AND TYPE FOR ANY JOB.*** *The wide variety of the Rex line assures the right equipment to fit any problem.*
4. ***NO GRIT WASHER NEEDED.*** *The recirculation principle of Rex equipment assures effective separation without need for a separate washer.*
5. ***RECTANGULAR CHANNELS.*** *Efficient, economical, simple construction with proper control of velocities assured by channel design and control section.*
6. ***HIGH CAPACITY.*** *Plenty of power and speed and proper spacing of bucket or flight spacings to handle maximum quantity of grit with minimum operating time.*
7. ***Z-METAL CHAIN . . .*** *maximum strength, toughness and corrosive resistant.*
8. ***SELF-ALIGNING BEARINGS . . .*** *simple installation, positive alignment, no binding.*
9. ***RENEWABLE WEARING SHOES . . .*** *for low maintenance costs.*
10. ***NEAT APPEARANCE.*** *Enclosed, streamlined head-sections . . . compact drive units.*

Write Chain Belt Company, 1610 West Bruce Street, Milwaukee 4, Wisconsin, for facts on how you may obtain these 10 important advantages for your jobs.



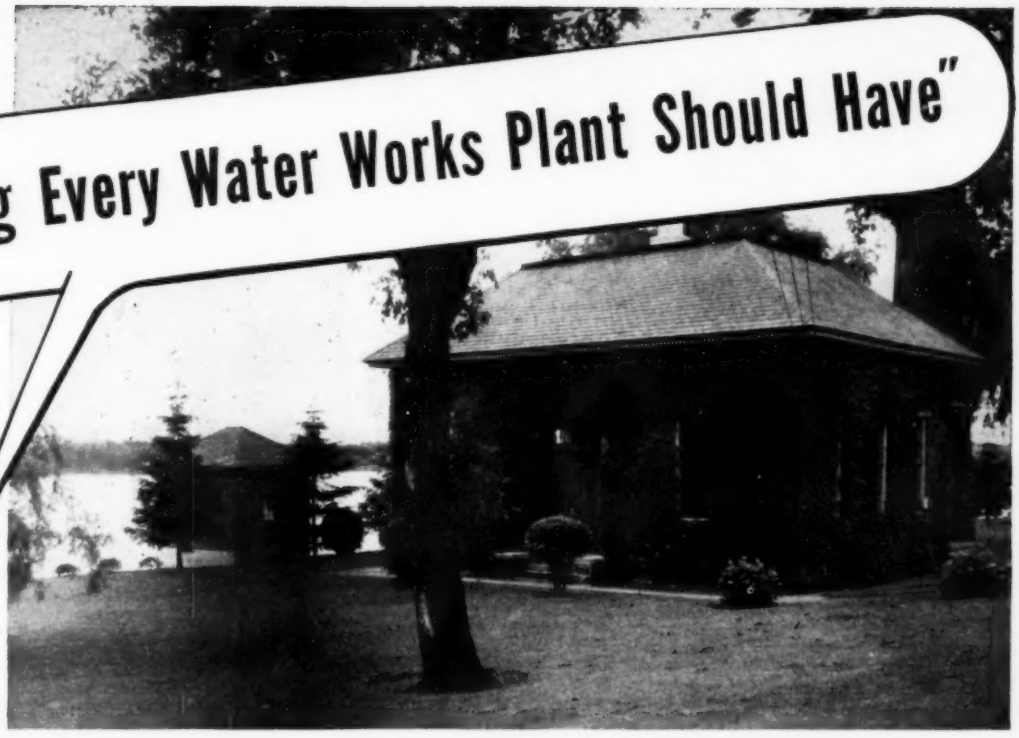
***Rex TYPE MI****—for small flows in shallow channels. Suitable for peak flows up to 3,500 g.p.m. Steel scrapers mounted on Rex Z-Metal Chain convey grit along tank bottom and up an inclined deck for delivery into cans or wheelbarrows. Recirculation is effected by replacing can with chute.*

***Rex TYPE ME****—for medium flows in shallow channels—suitable for flows of 14,000 to 17,500 g.p.m. V-Shaped bucket, mounted on Rex Z-Metal Chains, convey the grit along the tank bottom and elevate it to suitable height above the operating floor for discharge into cans. Stirring scrapers are interspersed between buckets to agitate the settled solids. Recirculation is effected by simply opening a slide gate.*



**REX SANITATION EQUIPMENT**
Member of the Water and Sewage Works Manufacturers Association
CHAIN BELT COMPANY of Milwaukee

# "Something Every Water Works Plant Should Have"



## STATES ROGER W. ESTY, SUPERINTENDENT OF DANVERS WATER AND SEWER BOARD, AFTER THE CONVINCING PERFORMANCE OF A BUILDERS VENTURI METER

The 20" x 8" Builders Venturi Meter at the Danvers, Mass., Pumping Station had recorded a normal flow into the reservoir for over 25 years. Then suddenly the Venturi Charts showed a sharp increase in water being pumped, and it was difficult to maintain the water level in the reservoir. After three weeks' investigation, a cracked gooseneck fitting on a 1¼" connection supplying a small plant was discovered. Immediately after repair of the fitting, the Venturi Chart dropped back to normal flow recordings and the proper reservoir level was gradually gained. Actual test of underground leakage disclosed water wastage of 1,176,000 gallons per week.

Builders Venturi Meter, famous for its accuracy, long life, low head loss and trouble-free performance, contributes to the efficient operation of many of America's leading waterworks, large and small. For Bulletin 293C and complete information, address Builders-Providence, Inc., (Division of Builders Iron Foundry), 10 Codding St., Providence 1, R. I.

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Venturi, Propelofio and Orifice Meters • Type M and Flo-Watch Instruments • Venturi Filter Controllers and Gauges • Master Controllers • Wheeler Filter Bottoms • Kennison Nozzles • Manometers • Chronoflo Telemeters • Conveyoflo Meters.

*Builders Type M Register-Indicator-Recorder and Herschel Standard Venturi Tube.*

**BUILDERS PROVIDENCE** *Instruments*

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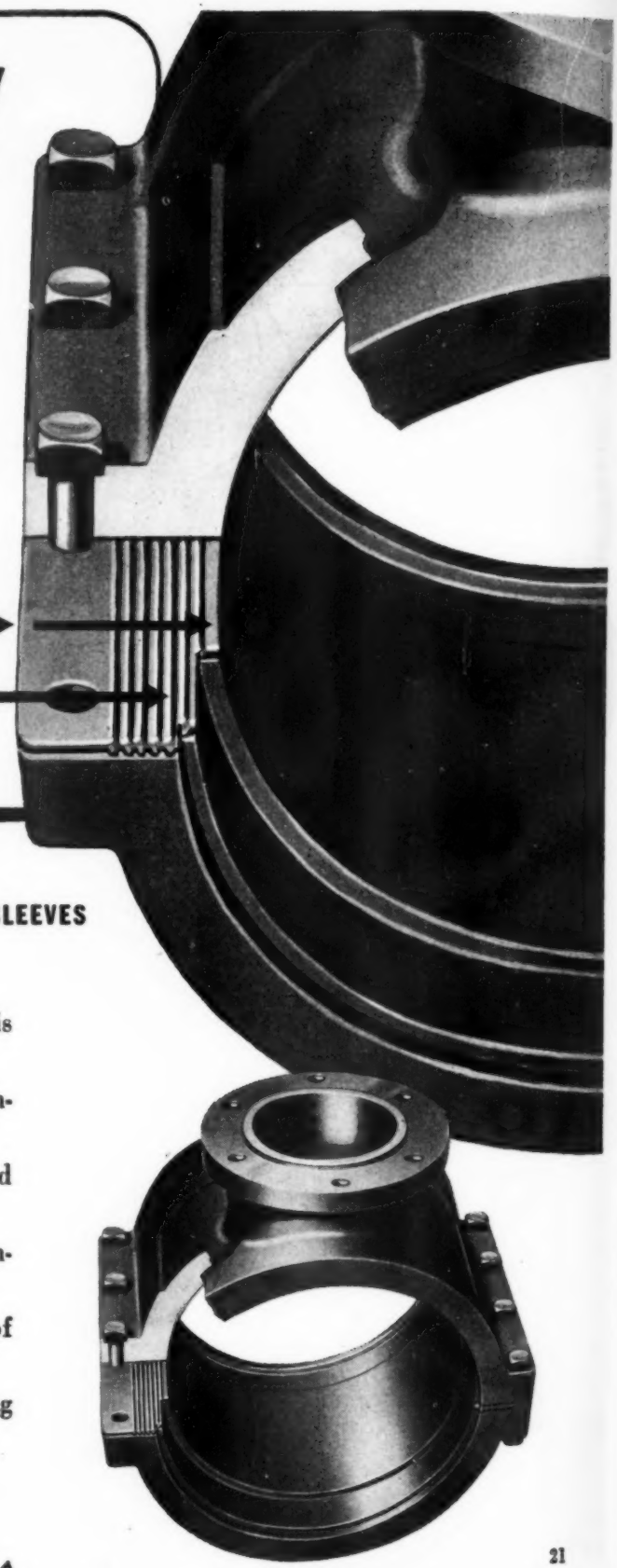
1. *COVERS FULL WIDTH AND LENGTH OF FLANGE*
2. *RAISED PREFORMED RIBS*



**FURNISHED WITH ALL SMITH BOLTED TAPPING SLEEVES**

The raised ribs are the unique feature of this new lead gasket. When the sleeve halves are assembled on the main, the raised ribs are compressed *first* and then the balance of the gasket is compressed, assuring a permanently tight, leak-proof sleeve assembly, free from strains and casting distortion.



* Patent Applied For

21

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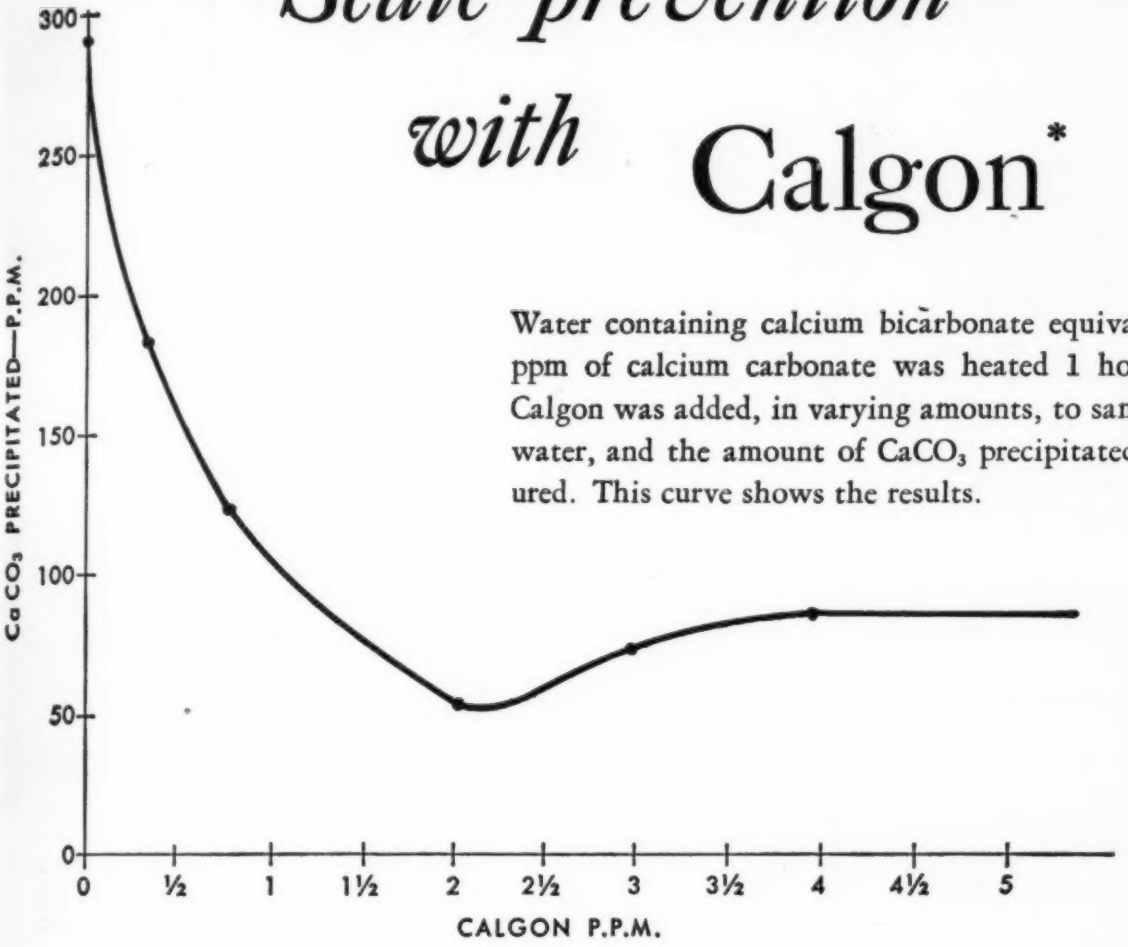
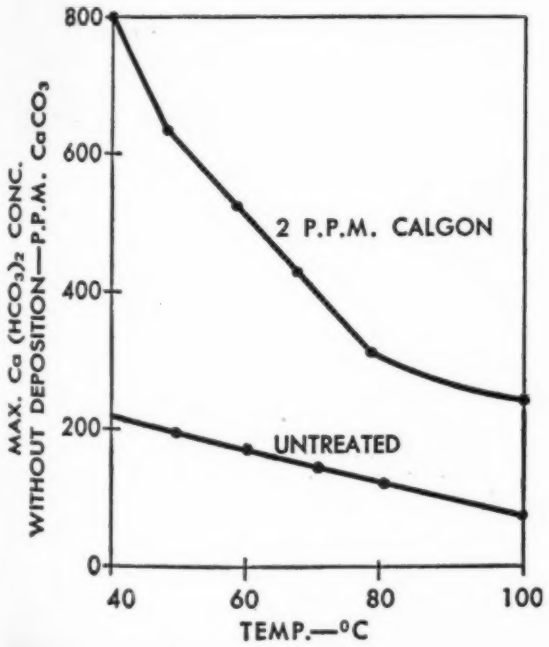
MAX. Ca $(HCO_3)_2$ CONC.

# *Scale prevention with* Calgon*




Water containing calcium bicarbonate equivalent to 600 ppm of calcium carbonate was heated 1 hour at 80°C. Calgon was added, in varying amounts, to samples of this water, and the amount of $CaCO_3$ precipitated was measured. This curve shows the results.




Further tests were made to determine the maximum calcium bicarbonate concentration which can be maintained without deposition at different temperatures, in untreated water and in water to which 2 ppm of Calgon has been added. The results are shown in this graph.

●

Calgon in your water supply system means less trouble in mains and distributing lines—even in home hot water heaters. We will be glad to send you full information.

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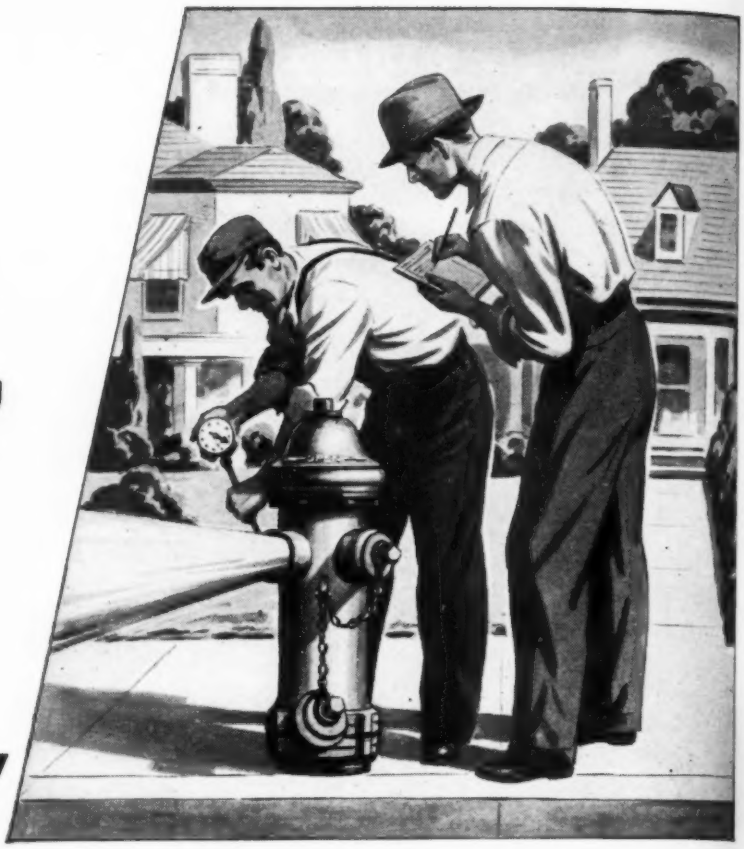
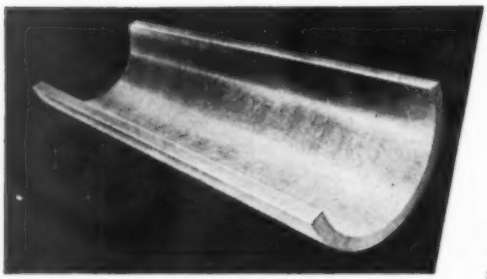
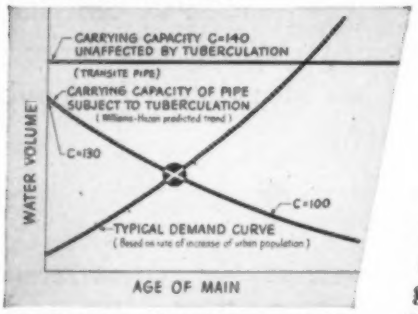
# "Plenty of 'fire-flow' here!"

## ...says the Testing Crew





**Transite's smooth interior is permanently unaffected by the destructive effects of tuberculation. Its high carrying capacity *stays high.***




**This chart shows that, although water demand continually increases, the carrying capacity of water mains subject to tuberculation progressively decreases. Note the much longer period during which a Transite line, represented by the straight curve, continues to meet demands.**

TESTS such as those made periodically by the fire insurance underwriters emphasize the fact that the most effective fire protection is provided by the water pipe with a *maintained* high carrying capacity.

Transite Pressure Pipe has this important advantage. It has an unusually high flow coefficient (C=140) . . . a coefficient which stays high because Transite, being made of asbestos and cement, is completely immune to tuberculation. This troublesome form of internal corrosion can never reduce Transite's initial high carrying capacity.

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The assurance of a maintained high carrying capacity is one of many reasons why it will pay you to investigate Transite Pressure Pipe when you plan water works improvements. Transite's proved resistance to corrosive soils . . . its tight, flexible joints that safeguard against underground leakage . . . its maintained strength and continued low maintenance are other advantages you will want to know more about in connection with your water works projects.

To get all the facts write for brochure TR-11A. Address Johns-Manville, Box 290, New York 16, N. Y.

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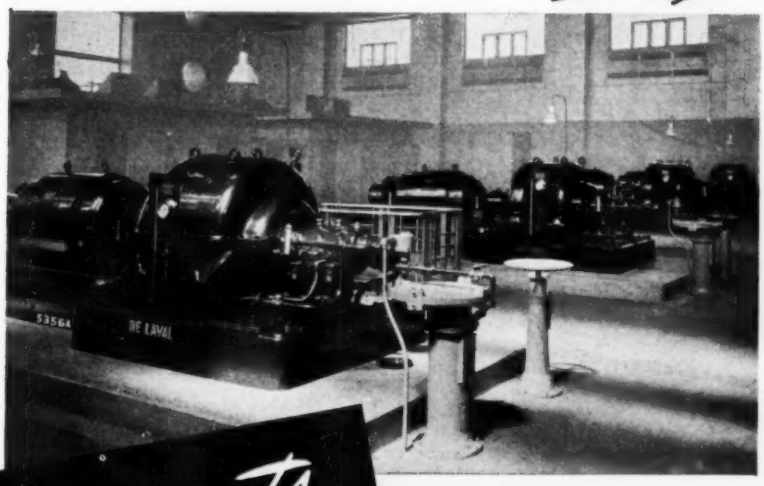
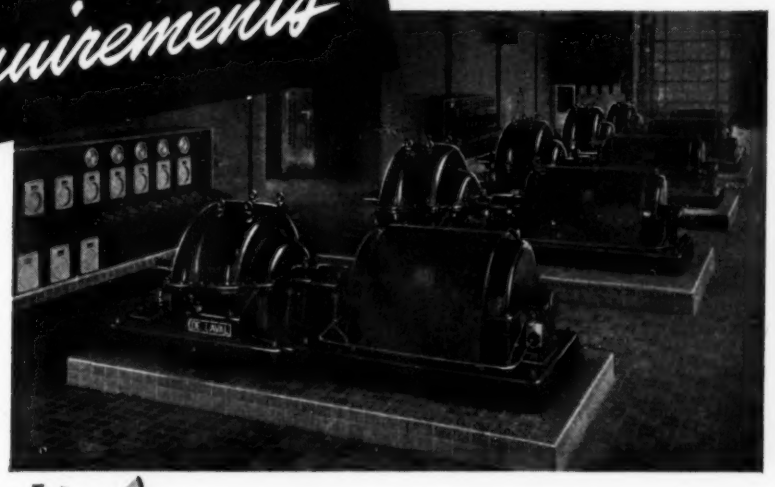
*Bowery Bay (City of New York),* Four De Laval 10,000 c.f.m., 7 psi compressors driven by 500 hp., 3600 rpm. wound rotor motors.

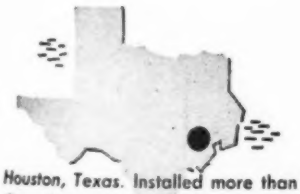



# Consult DE LAVAL about your Compressor Requirements

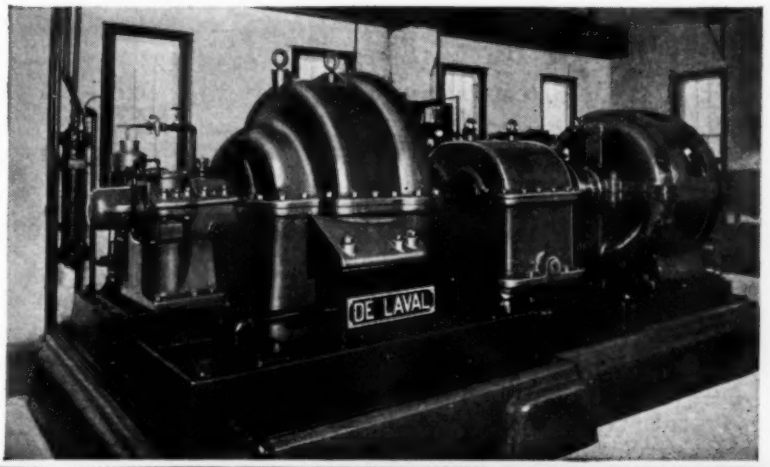
**De Laval centrifugal compressors now serve many important sewage treatment stations efficiently**



*Cleveland, Ohio.* De Laval compressors employed for activated sludge treatment at the Easterly Sewage Plant.



*Houston, Texas.* Installed more than 17 years ago in the City of Houston Sewage Treatment Plant, this compressor has given practically continuous service without ever requiring repairs or replacements.

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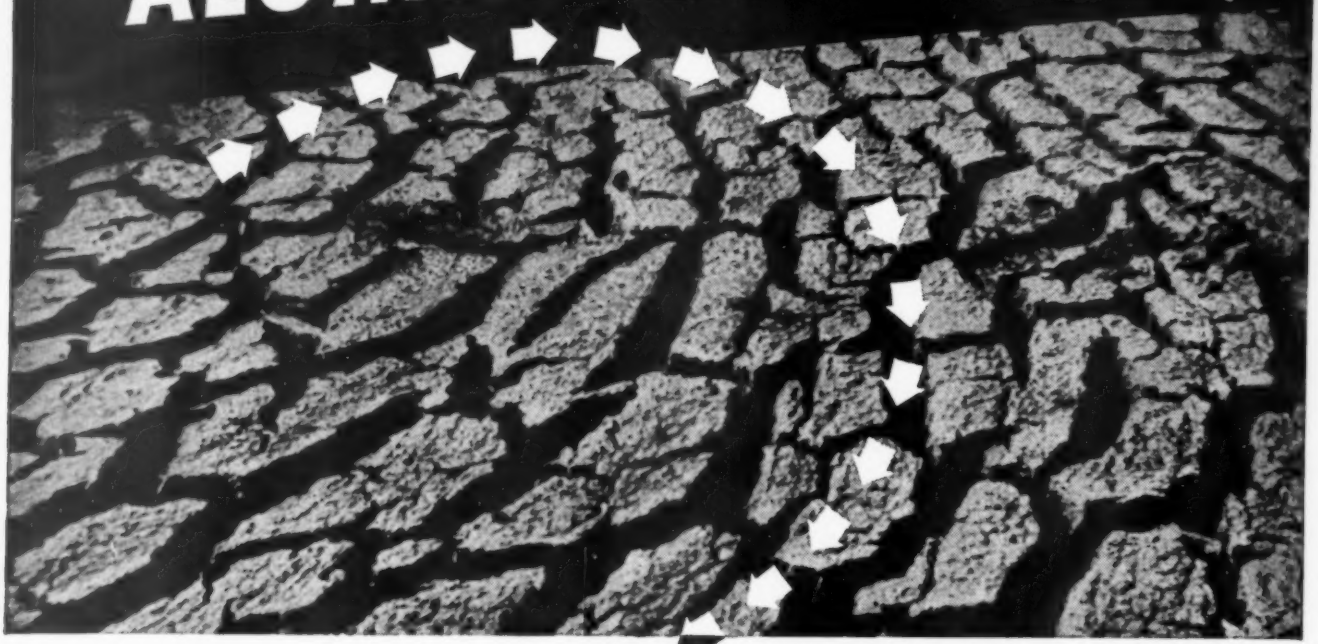

Well cracked sludge bed shortly after Aluminum Sulfate treatment.

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General Chemical Alum speeds sludge dewatering and drying on sand beds... capacity of beds may be doubled, even tripled . . . quick removal lessens chance of odor nuisance . . . reduced volume of cake decreases cost of removal. Sewage works operators the nation over count on the benefits obtained from Alum treatment throughout the year.

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# BECKMAN pH CONTROL

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Because Beckman Glass Electrode pH Equipment has pioneered one important pH advancement after another, it is widely recognized as the most advanced pH equipment available for all types of water and sewerage treating plants. It is installed in plants—both large and small—throughout the country.

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*This Beckman Automatic pH Indicator is the most advanced pH instrument available. Fully automatic, it gives continuous indication of pH and also operates standard types of potentiometric recording and controlling equipment.*

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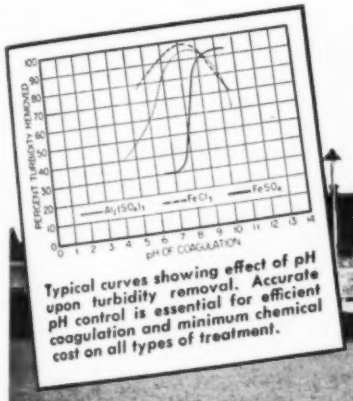
*ONE OF THE LARGEST water treating operations in the country—the Los Angeles Metropolitan Water District—uses Beckman pH Equipment throughout to insure maximum efficiency of its treating operations. This is but one of many similar Beckman pH installations in treating plants, large and small.*




Typical curves showing effect of pH upon turbidity removal. Accurate pH control is essential for efficient coagulation and minimum chemical cost on all types of treatment.

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*Hydraulically Operated:* For remote control of operation and for quicker, easier opening or closing. Can be supplied in any of the standard sizes of M & H A.W.W.A. gate valves, either high or low pressure.

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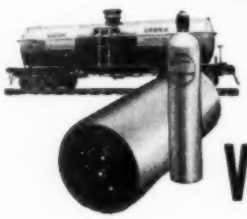

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*is the preferred dechlor...*

"Virginia" Esotoo provides the accurate control of residual chlorine which is an essential to palatability in municipal water-supply. Managers and plant engineers in increasing numbers recognize the value of $SO_2$ for the effective control of dechlorination in their filter-plants. The "Virginia" technical staff will cooperate with you to the fullest in solving your dechlor problems. Write for further information. VIRGINIA SMELTING COMPANY, West Norfolk, Virginia.

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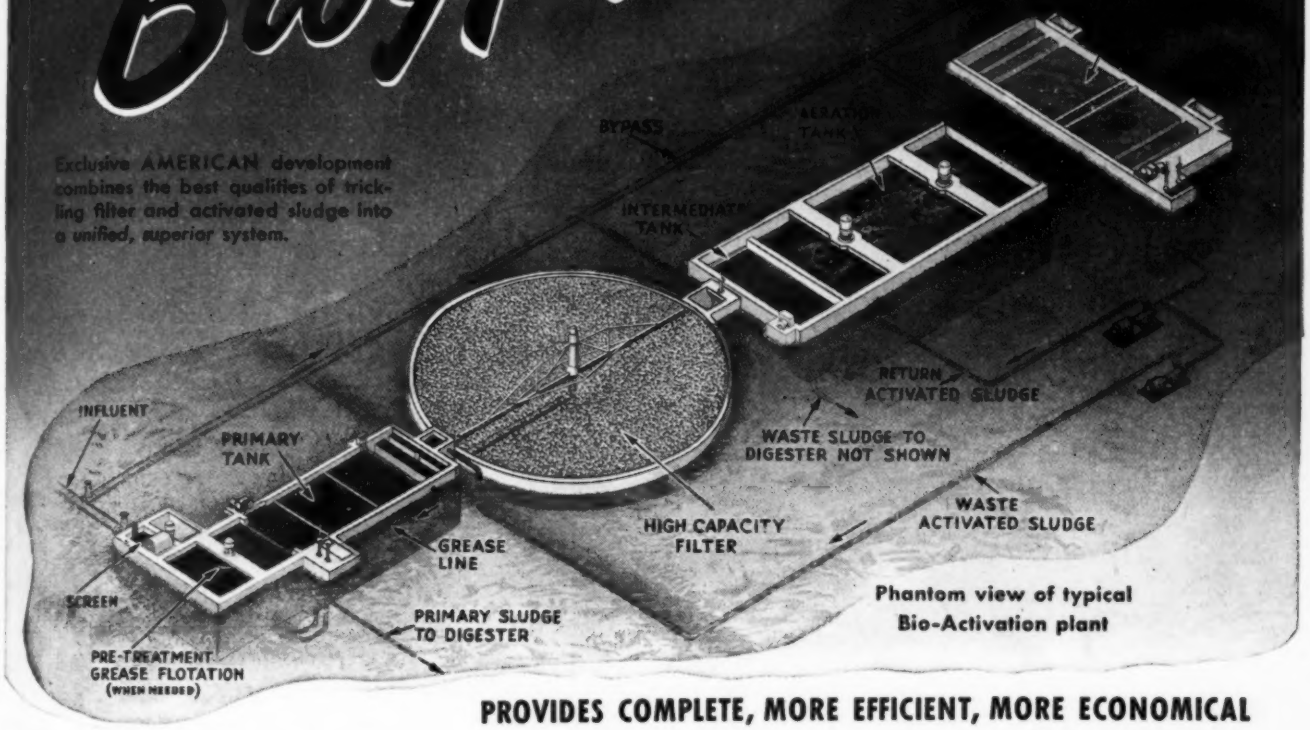
Exclusive AMERICAN development combines the best qualities of trickling filter and activated sludge into a unified, superior system.




Phantom view of typical Bio-Activation plant

## PROVIDES COMPLETE, MORE EFFICIENT, MORE ECONOMICAL TREATMENT... ELIMINATES COSTLY, TROUBLESOME UPSETS

The AMERICAN *Bio-Activation** system utilizes the best qualities of trickling filters and the activated sludge process . . . combines and integrates them by an exclusive method so that they work together to achieve a superior result under all conditions. In *Bio-Activation*, usual primary treatment is employed, followed by high capacity filters and short period intermediate sedimentation. Here, initial high removals of B.O.D. are obtained before sewage is passed to aeration tanks where activated sludge is developed. Because of the intermediate filter treatment which considerably reduces the strength of the primary effluent, the liquor can be readily handled by the activated sludge process *without the usual upsets caused by exceptional conditions and shock loads.*

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NO HIGHER construction cost
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GREATER ease of operation
MORE rugged and dependable service
INCREASED stability and efficiency

LIST OF INSTALLATIONS GLADLY FURNISHED ON REQUEST

* *Process Patented by American Well Works*

**Typical Average Monthly Results**

| Point of Sampling | 5-Day BOD | Suspended Solids |
|---|---|---|
| Raw Waste | 342 | 370 |
| Primary Effluent | 235 | 134 |
| Influent to Filter | 510 | ..... |
| Filter Effluent | 99 | 143 |
| Intermediate Effluent | 58 | 65 |
| % Reduction Filter Influent through Intermediate Effluent | 89.5 | ..... |
| Final Effluent | 13 | 15 |
| % Overall Removal | 97.5 | 96 |

**ENGINEERING SERVICE**

*Our staff of Sanitary Engineers is well qualified to cooperate with consulting and operating engineers in suggesting the process of treatment and type of equipment best suited to individual needs. Inquiries on new installations or improvements in existing plants will receive prompt attention.*

**Low-Cost Conversion of Existing Plants Can Double Capacity**

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Water Plant—Moberly, Mo.

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*So these comments of Mr. Harris really count: "I know what HTH can do, and I wouldn't be without it; in addition to using it every day, I insist that we keep at least 12 cases of HTH on hand for any possible emergency. In my opinion, HTH has no equal!"*

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L. H. ENSLOW, Editor
155 East 44th Street, New York 17, N. Y.

## COMING!

### Storage on the Distribution System

Is a long-sought discussion and analysis of modern methods of securing water storage on the distribution system. The author shows just how much storage should be provided on the distribution system, considering both the need and the economics of providing such storage through various methods of proven value and dependability. The author, who has made many studies leading to the choice of the overall most effective and economically built and operated storage on various distribution systems, is the recently made honorary member of A.S.C.E.—

CHAS. B. BURDICK, Cons. Engr.,
Alvord, Burdick & Howson, Engrs., Chicago.

### A Fresh Viewpoint on Water Rates

Will interest the readers of WATER & SEWAGE WORKS. The author who has made a careful study of rate making plans has developed what appears to be a very sound procedure involving a departure from exclusive use of the "service charge" or the "minimum charge" scheme in developing rates. A good case is made for the use of a combination of these two methods, along with other suggested considerations, in rate making for domestic, commercial and the smaller industrial accounts. The author, who has given considerable study to water rate making for a number of years, is—

MELVIN P. HATCHER, Director
Water Department, Kansas City, Mo.

### "Chloroben"—An Effective Chemical in Sewage Treatment

Is the title of an article which deals with the large scale experiments at Los Angeles where this chemical was used in upsewer treatment in combination with partial chlorination for the control of hydrogen sulphide formation and reduction of coliform bacteria in the sewers. New and recent data on the experimental work have been added to the original study, and the whole subject has been brought up to date and reevaluated by—

RUEBEN F. BROWN, Superintendent,
Sewer Maintenance Operations, Los Angeles, Calif.

### A Study of Costs of Making Water Main Extensions

Reveals some highly interesting facts on costs of making water main extensions over the past year or so. A comparison between letting main extensions to contract, as against the making of such extensions by the water utility force and employment of modern pipe handling, trenching, loading and backfilling machines is revealing. The evidence is clear enough to influence the cost conscious author to conclude that it is evident that future water works extensions must be made with modern machinery. This evidence comes from—

FRED J. RENY, Gen'l Mgr. & Treas.,
Portland Water District, Portland, Me.

### The Determination of Cyanides

Is the title of a paper by an engineer faced with the design of plant and choice of process for removal of cyanides from industrial wastes. He relates his experiences with the several methods for determination of cyanides and gives his reasons for choosing one method for high cyanide content and a different one for low cyanide content, having found that no single procedure sufficed for all concentrations of cyanide. The author, who will be remembered for his previous thoroughgoing articles, is—

T. R. HASELTINE, San. Engr.,
The Chester Engineers, Pittsburgh, Pa.

VOL. 94, NO. 4 APRIL, 1947

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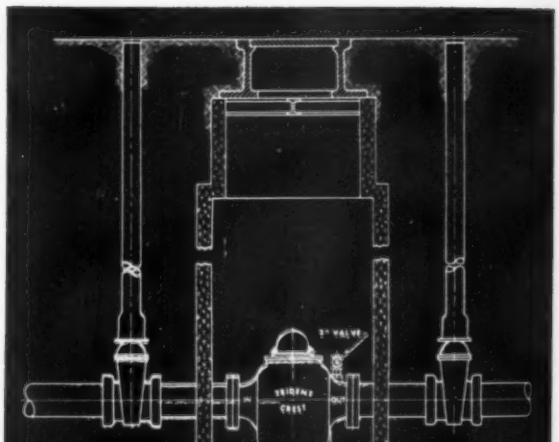

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WATER & SEWAGE WORKS

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# CORROSION IN VERTICAL TURBINE PUMPS

By T. E. LARSON
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STATE WATER SURVEY DIVISION
URBANA, ILL.

APPROXIMATELY 360 million gallons of water are pumped per day from some 3000 wells for about 1300 municipalities and industries in Illinois. A high proportion of these wells are equipped with turbine pumps. Within a 25 mile radius of Chicago there are about 500 municipal and industrial turbine pumps supplying approximately 85 mgd. Some 275 of these turbine pumps supply approximately 70 mgd. from wells penetrating the deep sandstones.

With non-pumping water levels receding in these wells as rapidly as 8 feet and in some cases 20 feet per year, it is not surprising to find that pump settings for these 275 pumps range as follows:

| Per Cent | Feet |
|---|---|
| 10 | 200 or less |
| 30 | 201—300 |
| 30 | 301—400 |
| 25 | 401—500 |
| 5 | 501—600 |

The capacities of these pumps range from 50 to 2,000 gal. per min.

By virtue of these settings the cost of pulling these pumps and the cost of replacing column pipe, shaft, and shaft tube is an item that can often amount to $6,000 per replacement. A little added cost for initial pipe protection can multiply the life of this portion of the installation several fold.

### *Effect of Water Level Recession*

The observed water level recession in these wells will necessarily result in lower settings for nearly all pumps in the near future. Conservation will slow up the rate of recession, but

The Author

nothing can avert the *eventual* approach to one or more of the following alternatives.

1. Lower pump settings limited by the efficiency of pumps for the present well bore diameters and relative economics of water from another source.
2. Use of surface water, lake or treated river water.
3. Recharge of water-bearing strata using cold water for recharge and withdrawing same in summer. This would of necessity be a cooperative measure, and the feasibility may be open to serious question.
4. Use of warm, salty water from greater depths for limited specific purposes.

Extreme conservation methods would force prospective and some established industries to resort to

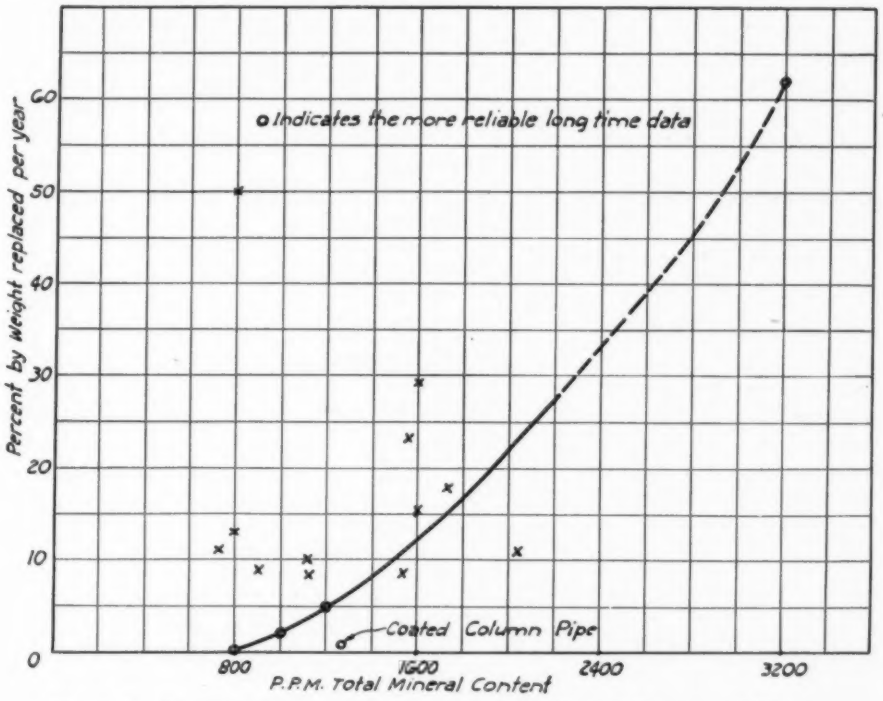
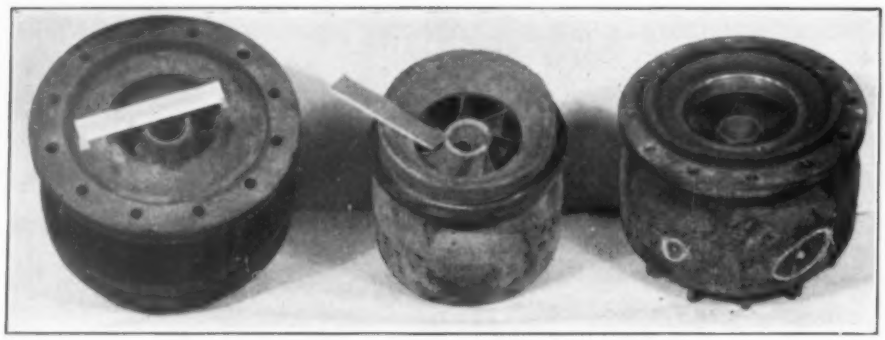



Fig. 1. Replacement of Pumps Plotted Against Mineral Content of Water



**Examples of Corrosion in Vertical Turbine Pumps**

*(Left)*
*Flanged 12 in. all cast iron bowl. Diameter at impeller ring 4⅞ in. (originally 4¾ in.) after 9 months' operation. Capacity reduced from 700 gpm. to 300 gpm. Also note corrosion at high pressure side of guide vanes and of cast iron bearing support. Water contained 1000-1500 ppm. mineral content and a high $CO_2$ content.*

*(Center)*
*Threaded 9 in. enameled cast iron bowl. Graphitization indicated on impeller seat and on exposed cast iron bearing support. Extent of corrosion in 13 months indicated by shadow below straight-edge. Stray currents were also recorded at this well where water of 1100 ppm. mineral content was used.*

*(Right)*
*Flanged 12 in. cast iron bowl with wear ring. After 14 years' service, two holes noted on bowl and much graphitization was evident on all cast iron exposed to water of 400 ppm. mineral content but considerable gas content.*

one of the last three alternatives. Since the best definition of "Conservation" is "intelligent use" it would appear that the water users in a critical area should organize and promote their own conservation methods, exchange data and information and utilize the available but not generally well-known factual data and methods for "intelligent use."

At many of these installations the quality of the water is such that corrosion can be expected. Although as a general rule water quality does not play a serious role unless the mineralization is greater than 700 ppm., it is not unusual to find that waters of 2000 to 3000 ppm. mineral content are used.

At the present time it is a rarity to find a pump removed from a well in this vicinity that has not been subject to corrosion to some extent.

A recent inspection of 11 deep well turbine units abandoned by the C. M. & St. P. & P. R. R. showed that 7 of these had been abandoned due to corrosion, two due to sand erosion, one due to obsolescence. One was apparently as good as new. These pumps had been removed from wells geographically distributed over the midwest. This would indicate that the pump corrosion problem is not local.

## PUMP CORROSION

In order that some confusion be removed from the question of corrosion of pumps, it is desirable to distinguish and recognize some four different types of attack. These four types are distinct and separate from mechanical erosion.

### *Galvanic Action*

Galvanic action is recognized by the concentrated corrosion of one metal in contact with and in close proximity to another. An excellent example is the pitting that takes place on the exposed common steel shaft between two bronze impellers. A knowledge of the metals and alloys used in the construction of the pump is helpful in determining whether galvanic action could take place or not and therefore constitute a possible cause for the observed attack.

The rate of galvanic attack is in proportion to the relative exposed area of the cathodic metal to the exposed anodic area. It is also in proportion to the conductivity of the water which in turn is dependent on the total mineral content of the water.

The curve in Fig. 1 indicates the effect of water quality on galvanic action and also on general corrosion as may result from contact of mineralized water with *any* piece of steel or cast iron. Since the original publication of this curve (*JAWWA* 36, 886, 1944) nearly all of the points greatly distant from the curve have been explained by stray currents or by a high gas content.

One effect of dissolved oxygen is to decrease polarization or to increase the potential difference or the force driving galvanic current from the anode to the cathode. In other cases particularly with some hard waters it is recognized that dissolved oxygen can help to reduce corrosion by assisting in maintaining a calcium carbonate and iron oxide film or coating.

Increasing the relative velocity between the water and the metal by increasing the motor speed is generally believed to cause an increase in the corrosion rate. It is again recognized that under specific conditions of protective action (polarization) the reverse condition may exist. It has often been demonstrated that an idle pump corrodes faster than one in use. The use of bronze bowls with bronze impellers eliminates the possibility of galvanic action between impellers and bowls.

Galvanic action can also be enhanced by a situation where two galvanic cells are set up in series in the installation. Such a situation exists where bronze impellers are used with cast iron bowls and at the same time copper-alloy bearing-retainers are used with a water lubricated steel shaft or in the instance of oil lubricated pumps where bronze impellers are used with cast iron bowls and water is permitted to enter the inclosure tube above the bowls and in contact with the bronze bearings and steel shaft.

It is obvious in these cases that current will flow from the iron impeller seats through the water to the bronze impellers and up the shaft to the bearings where it will leave the shaft through the water to the bearing retainers or to the bearings and down the column pipe or the inclosure tube to the bowls—a vicious cycle. It would be difficult to reverse one of the cells to exactly counteract the other and without inaugurating a concentrated attack at another point.

There is considerable room for argument when any discussion on galvanic action takes place. Although the fundamental theories have been fairly well developed, the practical application of these theories is often obscure and requires considerable experimentation on the actual finished product.

### *Water Line Corrosion*

Water line corrosion is also common and due to the existence of what is commonly called the oxygen concentration cell. It is adequately described in many textbooks. The obvious simple remedy is paint or some other good protective coating.

### *Carbon Dioxide Corrosion*

Carbon dioxide corrosion is that which takes place at the high pressure points in the pump bowls and inside the column pipe and outside the shaft tube. Cavitation is distinguished from this corrosion by the fact that it takes place at the low pressure points on the impellers. This carbon dioxide corrosion is recognized by the occurrence of noticeable pitting at certain points on the guide vanes in the bowls and in the column pipe and on the shaft tube particularly just above the bowls and to a lesser extent just above the spiders.

It may be suggested that this is caused by the release of gas bubbles in the water at low pressure points on the underside of the impellers and possibly at the entrance to the suction pipe. This can happen particularly if rough edges are present. These gas bubbles are composed of nitrogen, water vapor and carbon dioxide and can be expected to form in any water normally present in the ground under artesian pressure. These gas bubbles pass through the turbine unit and column pipe and undergo various changes in volume due to the changes in pressure that take place and are mechanically carried through the pump and into the column pipe.

On rapid increase in pressure the bubbles exist in the water with carbon dioxide gas at a high solution potential and as the carbon dioxide dissolves, the water film on the surface of each bubble is excessively acid due to the formation of carbonic acid. As the gas bubble with its acidic surface film passes over metal, corrosive action takes place due to the carbonic acid. This type of corrosion has been recognized at the high pressure points on the vanes in the bowls, at points inside the column pipe located from 6 in. to 2 ft. above the top of the bowls and at points located several inches above the spiders between the pump shaft or shaft tube and the column pipe. The extent to which this corrosion is noted above the spiders decreases with increased distance above the pump bowls. This decrease is due to the fact that as the water moves up the column pipe, the carbon dioxide pressure within the bubbles decreases and the relative amount of corrosion decreases accordingly.

This theory also explains, in part, the reason for the more prevalent corrosion reported in the Chicago area at the present time than that formerly experienced. This is due to the fact that the static and dynamic head on the waters as they exist in the sandstones is less now than formerly and, therefore, the tendency for bubble formation is greater than before. An increased tendency for bubble formation in present installations can perhaps also be explained by the fact that greater capacity pumping units are now used, creating a greater pressure drop at the suction end of the pump. These greater capacity units are not always accompanied by proper increase in column pipe or suction pipe.

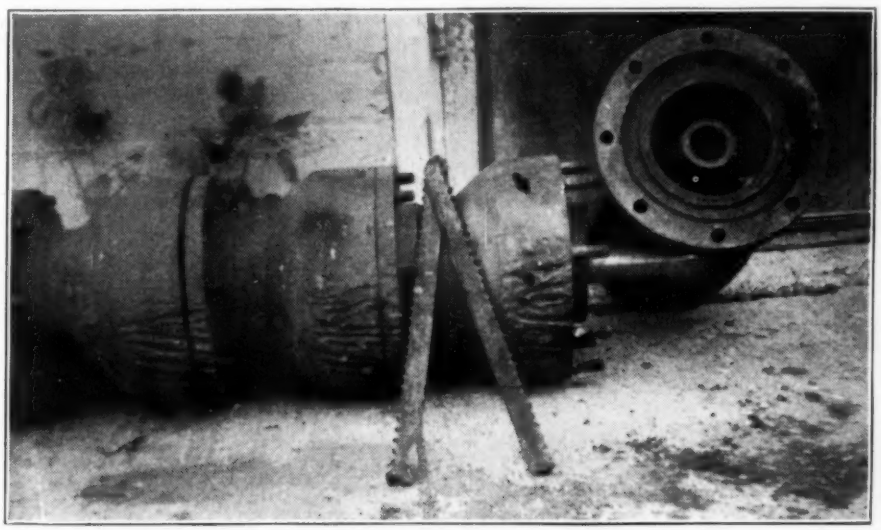
The same type of corrosion takes place at shallow settings where water of high carbon dioxide content is handled. The presence of hydrogen sulfide also increases the corrosion tendency. A "worm-eaten" shaft or shaft tube is also due to this phenomenon.

### *Stray Currents—a Question*

Stray currents have been accused of causing corrosion in many cases where no other reason is evident. Perhaps this is justified and perhaps not. No thorough study has been made on this factor in pump corrosion and it is questionable whether completely satisfactory field data can ever be obtained. Some indications can, however, be obtained by measurements of possible current flow with a milli-voltmeter between the discharge line and the pump head and between the column pipe and the well casing. If the potential difference is irregular it is assumed that the cause is not due to galvanic potentials but to stray currents. Any further interpretation must for the present be only theoretical and must recognize the fact that electric current takes the path of least resistance to complete its circuit or to pass from a point of high potential to one of lower potential.

Stray currents have been observed and are known to exist at many installations. It is generally a simple matter to connect a milli-voltmeter across a disconnected discharge line or from the pump head to the well casing. To what extent they may be damaging to the pump will depend on whether the polarity is such as to enhance or inhibit galvanic action. Inhibition is included since cathodic protection is actually the application of a controlled "stray" current. As to the source of stray currents, (1) they may be transmitted from grounded lines through the distribution pipe line to the pump or (2) they may be transmitted through the earth structure to the well and pump from electrified railways or other grounded electrical power equipment.

A series of tests for possible stray currents have been made at 32 wells in Illinois. It was significant to note that the well casing was negative to the discharge pipe line or to the column pipe in 18 out of 19 cases where such potential could be measured. At about 50 per cent of the wells a varying potential difference was noted to be present between the discharge line and pump head or between the pump head and the well casing. These tests of course tell little about ground



**A Combination of Galvanic and $CO_2$ Attack**

*The effect of galvanic action is visible on the exterior of this 7-stage 10 in. C.I. well pump which had been in contact with a brass well screen for about 5 years. The two tooth-edged strips are remnants of the brass strainer. Through the walls of the bottom bowl of the pump are two holes resulting from $CO_2$ corrosion. The water had a mineral content of about 500 ppm., alkalinity of 400 ppm., and a high methane and carbon dioxide content.*

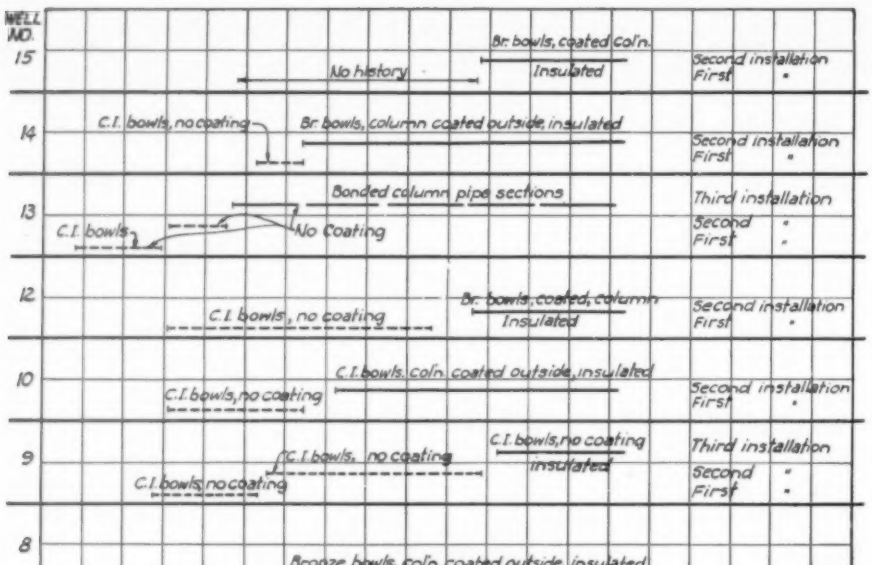



**Fig. 2. Pump History**

***The length of life is indicated by the length of the line.***

currents which may exist under ground from one depth to another.

### *Alternating Current*

Thus far discussion has referred to direct current. Alternating current should not be overlooked since it is entirely possible for alternating current to be rectified to give a pulsating direct current. In one instance, an A.C. potential (but no D.C.) was observed between the power cable conduit and the pump head. Excessive corrosion was also noted at this installation. A duplicate installation had little corrosion where the cable conduit had been left off the cable and therefore no metallic contact was present.

Stray A.C. shaft currents have been noted to cause corrosion at bearings in industrial motors and generators. A.C. currents have also been proven to be corrosive to underground lead cable sheaths.

If stray currents are the cause of deterioration it should perhaps be emphasized that it is futile to experiment on the choice of metals to prevent repeated corrosion damage.

## PUMP CORROSION PREVENTION

Prevention of corrosion will depend largely on the type of installation, the corrosion encountered and the economics involved. It is recognized that galvanic corrosion can be reduced by the use of all bronze bowls with bronze impellers and stainless steel impeller shaft. The additional cost over a similar installation with CI bowls, bronze impellers and stainless steel shaft is in the neighborhood of 80 per cent for the turbine unit but often only about 10-20 per cent of the total cost of the installation. Over a 5-year period a decided net savings should be effected (1) in power costs by a *maintained* efficiency, (2) by the elimination of the replacements and (3) by elimination of the costly necessity for pulling the pump.

A protected column pipe and shaft tube is almost a necessity for any deep setting. Hot-spun bitumastic (Plastex) Natasco and other coatings have proven effective. A problem still exists where wrench marks have damaged the coating on the shaft tube. Painting these fractures on the spot is the least that can be done to repair such damage and prevent accelerated attack at these points. Here again the cost of prevention is a minor fraction of the savings.

Column pipe protection can be obtained at an added cost of 5 to 50 per cent of the cost of the pipe itself. With regard to protective coatings in general, it is first essential that the metal surface be clean and dry before the application of any coating. It is also recognized that in general the more difficult corrosive conditions require more costly protective measures. The question of "How costly must the coating be to be effective" will best be answered by experience and correlation of cooperative data. The following protective coatings are among the more commonly used and have varying protective values as well as varying costs.

1. Baked-on resins.
2. Resin-base paints.
3. Chlorinated rubber.
4. Rubber-base paints.
5. Asphalt and coal tar-base paints.
6. Lead base and lead-chromate base oil paints.

It should be emphasized that an expensive coating will be of no more value than a cheap coating if the pipe is not clean and dry during the application.

Several cathodic protection installations have been made in Illinois. These have involved the use of an auxiliary electrode at the suction pipe and forcing a small current through it and using the whole pump unit as a cathode for the return of current to the surface where it is tapped off the pump head, the head shaft and in some cases off the well casing. A special arrangement is provided to make the lower end of the impeller shaft and the bowls of equal potential. These installations have not been in use sufficiently long to judge their economic value.

The insertion of insulation between the discharge line and the pump head is being used to inhibit or prevent stray current electrolyses. In some installations the well casing is also insulated from the pump head and column pipe. Where such protective measures are installed it is imperative that the housing for the power cables and the return water lines for water lubricated pumps should also be insulated from the pump head or the efforts will be nullified.

Fig. 2 shows the history of pump replacements in seven wells used by an industry whose property is overrun by stray currents from their operating machinery.

At the present time there is no standardization among manufacturers on specifications for materials for corrosion prevention under various conditions. This is due to the absence of any complete set of unbiased comparative data on the economics of repair and maintenance and to the lack of laboratory studies on the prevalence of galvanic currents within the units.

Pump manufacturers and owners could satisfactorily obtain comparative data on the value of prevention methods by conducting standard tests for efficiency periodically on

actual installations from the date of installation to the time of removal. These tests could be made on each of a series of pumps of known construction and known operating conditions and the pumps could be singularly equipped with and without the various protective methods against corrosion.

A thorough and critical inspection should be made on each after removing for comparison. Such data at the end of a five or ten year period would then be available for (1) standardization purposes, (2) for comparison from the standpoint of economic operation *and* economic maintenance and (3) for publication for reference purposes. Nothing will speak to the plant engineers more effectively than "dollars and cents" figures obtained from actual field installations.

There are other methods of attack available to the engineers in the pump industry. Laboratory tests should disclose much factual data on the prevention of the corrosive damage experienced in pumps. There is room for an appreciable amount of theoretical and practical "engineering" on the subject of galvanic and stray current corrosion.

### *Acid Treatment*

With regard to efficiency of operation, many pumps have been inspected which were coated or even filled with an accumulation of iron oxide in the bowls and sometimes in the impellers. In one installation a deposit of calcium carbonate of one-half inch thickness was present in the discharge pipe. The sources of such deposits are questionable. There is good evidence that a large portion of the iron deposits are due to an accumulation of corrosion product from the bowls. These bowls appear to retain their original shape but careful inspection will nearly always show the cast iron surface to be softened or graphitic.

A deposit of this type naturally reduces efficiency of operation and for deep settings it is costly to remove by pulling the pump. It is entirely feasible to clean such deposits and increase the efficiency of operation by treating these pumps *in place* with inhibited hydrochloric acid.

The author wishes to express his appreciation for the assistance provided by J. B. Millis of the Ill. State Water Survey staff in the collection of the data discussed herein.

## NEW REFUSE INCINERATORS FOR HONOLULU

With the recent completion of the two incinerators started as war public works projects, Honolulu now has a capacity of refuse reduction of 400 tons per each 24 hours of incineration. The structures are almost identical in plan and design and cost an aggregate of $1,140,554, of which $619,200 was contained in a Federal Works Agency grant. With these facilities for refuge disposal in operation, a serious hazard to public health has been met.

The Kapalama incinerator between Honolulu and Pearl Harbor was completed first and has been in operation several months. Both plants are on the water front, are colored a light green, and with their 300-foot ramps and 150-foot chimneys constitute new landmarks in Honolulu's attractive shoreline. The Boston firm of Metcalf and Eddy was the designing engineer, and construction of both buildings in a single contract was awarded to the McDonald Construction Company of St. Louis, Mo. Work was delayed by labor shortages, adverse war-time conditions, shipping difficulties and post-war strikes.

On V-J Day the Kapalama plant stood at 75 per cent completion and the Kewalo plant at 50 per cent, but in view of the serious residual need, FWA authorized completion of the projects, the local authorities agreeing to meet additional costs. The burners maintain a temperature of 1,300 degrees F. and are large enough to handle and burn the carcasses of horses and cattle. Besides the two new plants, an area of 63 acres has been acquired for the disposal of incombustible refuse.

Honolulu County was faced with a need for refuse disposal as far back as May 1941, when the U. S. District Engineers directed the authorities to vacate the Kalihi-kai dumping grounds of 13 years' duration and obtain a solution of garbage disposal elsewhere.

After the Pearl Harbor attack, garbage mixed with combustible rubbish could no longer be burned in the open without extinguishing the fires each night in necessary blackouts. The military authorities also banned the dumping at sea even if barge and towing facilities had been available, both because of danger of contaminating the island beaches and the wartime threat of ship channels being disclosed by refuse trails.

Faced with these conditions, the Honolulu City-County authorities applied to the Federal Works Agency for Lanham Act funds to assist in the cost of new incinerators, an application which was concurred in by the U. S. Public Health Service and the War Department. Major General Philip B. Fleming, Federal Works Administrator, approved the grant, but it was not until June 1944 that materials and man-power were available to start the work.

**Kapalama Incinerator to Serve City and County of Honolulu**

*(One of two incinerators having combined capacity of 400 tons per day.)*

Besides the new incineration facilities, an old 75-ton capacity plant near the Kewalo Basin may be used in emergencies.

# HYDRAULICS FOR THE PRACTICAL WATER WORKS MAN

*The Eighth of a Series of Articles*

## Effect of Valves in Pipes and Flows Through Fire Nozzles and Metering Nozzles

By ROBERT W. ANGUS, M.E.
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TO further illustrate the great number and the variety of problems that may be solved by the principles laid down, the action of valves in pipes may be examined. As ordinarily made, valves produce two effects, for they control the area of the waterway through them and they also produce relatively large losses of head, particularly as they approach the closed position. Reduction in the area of the waterway alone is not a very effective way to control the flow.

The Author

### *Valve Experiments*

Valves are commonly of either the gate or the globe type, the former being very largely used on medium or very large water pipes and the latter on smaller ones. There is no fixed rule in this matter. The loss of head through globe valves is higher than that through gate valves under similar conditions, as an examination of their constructions would suggest, but the data are much more complete for the gate valves than for the others. Probably the best authority on this subject is the excellent booklet issued in 1922 by the Engineering Experiment Station of the University of Wisconsin, Madison, Wis., which records an exhaustive investigation by Professor C. I. Corp under the title, "Experiments on the Loss of Head in Valves and Pipes of One-half to Twelve Inches Diameter." The largest globe valve tested was two inch.

This is not the place to enter into a detailed discussion of this work and we must be content with such abstracts from it as will suit our present purposes. Realizing that the loss of head in valves, as well as in most other fittings and pipes through which water flows, bears a relation to the velocity head in the pipe to which they are attached, the experiments were used to give, amongst other things, a coefficient "k" for each size of valve and for different openings of each valve, the coefficient being such that the loss of head in the valve for the given opening is

$$\frac{KV^2}{64.3}$$

where v is the velocity in the pipe.

Crane and Chapman valves were mainly used and the valve opening is designated by the height of the opening under the gate relative to the diameter of the full opening under the gate, or quite closely it is the number of turns of the stem after the waterway begins to open relative to the number of turns required for full opening. (In most valves the stem must be turned some before the waterway actually begins to open and these idle turns are not counted.) For 12 in. gate valves the following values of **k** were taken from Professor Corp's curves:

**For 12-in. Gate Valves—Values of K in $KV^2/64.3$**

giving the loss of head in feet, where V is the pipe velocity in ft per sec.

| Valve Opening | Value of K |
|---|---|
| Full | 0.07 |
| 3/4 | 0.41 |
| 1/2 | 2.25 |
| 1/4 | 13 |
| 1/8 | 56 |

For a 2 in. globe valve, fully open, k is 7.1 as compared with 0.16 for the same size gate valve when fully open. The very high relative loss in the globe valve is due to the tortuous passages for the water.

### *Effect of Closing a Valve In a Pipe Line*

To show the use of these numbers, and also to obtain an intelligent view of how a valve acts, we shall take two examples, the one of a 12 in. new pipe, 100 ft. long, between two reservoirs and with a 12 in. gate valve in the line. Inasmuch as it makes no difference where the valve is so long as it is not very close to the outlet end, it will be assumed to be placed in the center of the line. The action of closing the valve in this case will be compared with what happens in a similar operation where the valve is in a 12 in. pipe 1000 ft. long and old enough to show an increase of 20 per cent above the friction factors of Table II.

The illustration in Fig. 27 covers both cases, and in order to make the comparison as fair as possible, approximately the same velocity is assumed to exist in both pipes when the valve is fully open. For this reason the head **H** is 2 ft. for the short pipe and 17 ft. for the long one.

The pipes are horizontal and the datum is selected along the axis so that all elevation heads on the pipe are zero. Starting with a pound of water at the surface of the left hand reservoir, Fig. 27, where there is neither pressure nor velocity, the total head is evidently $h_1$ and if the conditions at the right hand reservoir, just where the water leaves the pipe, are examined it is seen that the pressure head is $h_2$ and the velocity head is

$$\frac{V^2}{64.3}$$

where **v** is the velocity in the pipe. Hence

$$h_1 = h_2 + \frac{V^2}{64.3} + F$$

Now **F** is the friction head lost in the pipe and valve, and since the pipe is shown with bell-mouth entry

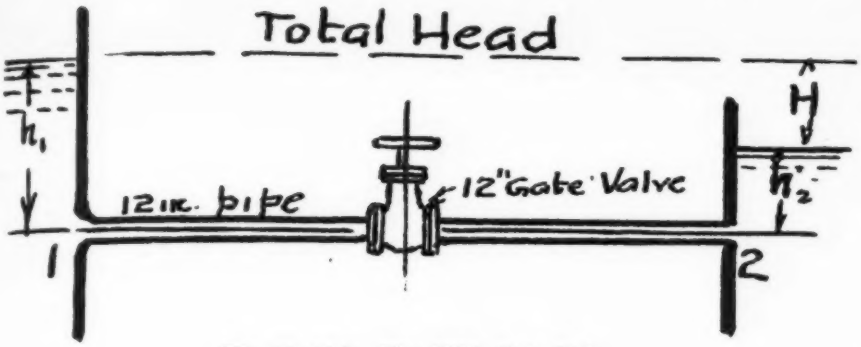


Fig. 27. 12-in. Pipe With Gate Valve

the loss at that end of the pipe is small enough to be neglected. The total loss F is then

$$\frac{fl}{d}\frac{V^2}{64.3} + \frac{KV^2}{64.3}$$

and by placing these values in the equation above there results

$$h_1 - h_2 = H = \left(1 + K + \frac{fl}{d}\right)\frac{V^2}{64.3}$$

As the velocity is likely to be less than 5 ft. per sec. the value of f from Table II will lie between 0.021 and 0.025 for the new pipe, but will be 20 per cent higher for the old pipe and will, therefore, lie between 0.0252 and 0.03 in the latter case. It will be necessary to make preliminary estimates of f for the first trial, but it may be necessary to repeat the calculations with better values of f once the approximate velocity is known.

Starting with the shorter pipe and the valve wide open, we write

$$2 = \left(1 + 0.07 + \frac{0.021 \times 100}{1}\right)\frac{V^2}{64.3}$$

or—

$$\frac{V^2}{64.3}$$

is found to be 0.631 ft. and the corresponding pipe velocity v is 6.37 ft. per sec. With the same pipe and the valve three-fourths open, the only change in the equation above is that 0.07 will be replaced by 0.41 and consequently the pipe velocity will be 6.05 ft. per sec. Similarly, for the half open valve v is 4.89 ft. per sec. while for the one-quarter open position it is 2.81 ft. per sec., and for the one-eighth open position it is 1.47 ft. per sec. (For the last case the value 0.025 was used for f.)

### *Long Pipe with Valve Being Closed*

Before discussing these results, the corresponding figures for the long pipe will be obtained, for which case the head H is taken as 17 ft. so as to give approximately the same initial pipe velocity as was used for the shorter pipe. For the full open valve we have

$$17 = (1 + 0.07 + 25.2)\frac{V^2}{64.3}$$

from which the pipe velocity is 6.45 ft. per sec. For the ¾, ½, ¼ and ⅛ valve openings the values of the pipe velocity are found to be 6.41, 6.20, 5.28, and 3.62 ft. per sec., respectively.

For convenience the results are set out in the following table.

These figures are plotted on Fig. 28, on which the discharge for each valve opening is given in percentage of that with the valve fully open. Obviously with the short pipe, in which the pipe resistance is generally much smaller than in the valve, the effect of valve closing is evident from the beginning of the operation while for the long pipe it is fairly accurate to say that the first part of the closing has little effect, for when the valve has been closed half way the discharge is still over 96 per cent of that for the full open position. The hydraulic lines for the long pipe with the valve three-quarters closed are shown on Fig. 29 and attention is called to low pressure in the valve.

### *Flow Through Nozzles*

Only one other illustration of the flow in closed pipes will be given and that is in connection with the nozzle, a very common application of which is in connection with fire streams. Fire nozzles are made of various sizes and shapes, but attention will be confined to the smooth parallel type. The nozzles are threaded so that the fireman may conveniently attach any desired one to the play pipe, the latter being permanently attached to the fire hose (usually 2½ in.) and which is connected to the hydrant or fire engine. As a general thing, a single line of hose is used for a single nozzle but for bad fires, requiring a lot of water and a strong stream, two or even three lines of 2½ in. hose may be coupled in parallel to the engine and joined at the outlet end by a Siamese connection to a short piece of larger hose with play pipe on which a single large nozzle may be used.

It is not the job of the water works engineer to specify the requirements for fire fighting; that is

TABLE II

**Friction Factors for Smooth, Clean, Coated Cast Iron Pipes**

**(Add 5% for riveted steel and at least 50% for old rusted pipes. Copper and brass and lead pipes have lower values.)**

| Pipe Diameter in. | Velocity in Pipe, Ft. per. Sec. | | | | | |
|---|---|---|---|---|---|---|
| | 1.0 | 2.0 | 3.0 | 4.0 | 5.0 | 10.0 |
| 1 | .035 | .032 | .030 | .029 | .027 | .024 |
| 2 | .033 | .030 | .028 | .027 | .026 | .024 |
| 4 | .031 | .028 | .026 | .025 | .025 | .023 |
| 6 | .029 | .026 | .025 | .024 | .024 | .022 |
| 12 | .025 | .023 | .022 | .022 | .021 | .020 |
| 16 | .023 | .022 | .021 | .021 | .020 | .019 |

| | Valve Opening | Full | ¾ | ½ | ¼ | ⅛ |
|---|---|---|---|---|---|---|
| Short Pipe H = 2 ft. | Pipe velocity, ft. per sec. | 6.37 | 6.05 | 4.89 | 2.81 | 1.47 |
| | Flow, gal. per min. | 2248 | 2135 | 1726 | 992 | 519 |
| | Percent full open flow | 100 | 95.0 | 76.8 | 44.1 | 23.1 |
| | **Valve Opening** | **Full** | **¾** | **½** | **¼** | **⅛** |
| Long Pipe H = 17 ft. | Pipe velocity, ft. per sec. | 6.45 | 6.41 | 6.20 | 5.28 | 3.62 |
| | Flow, gal. per min. | 2275 | 2260 | 2190 | 1850 | 1277 |
| | Percent full open flow | 100 | 99.4 | 96.4 | 81.4 | 56.2 |

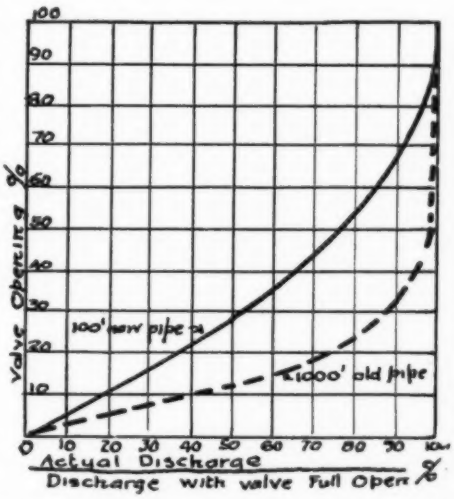


Fig. 28. Effect of Closing the Valve in the Line Shown in Fig. 27

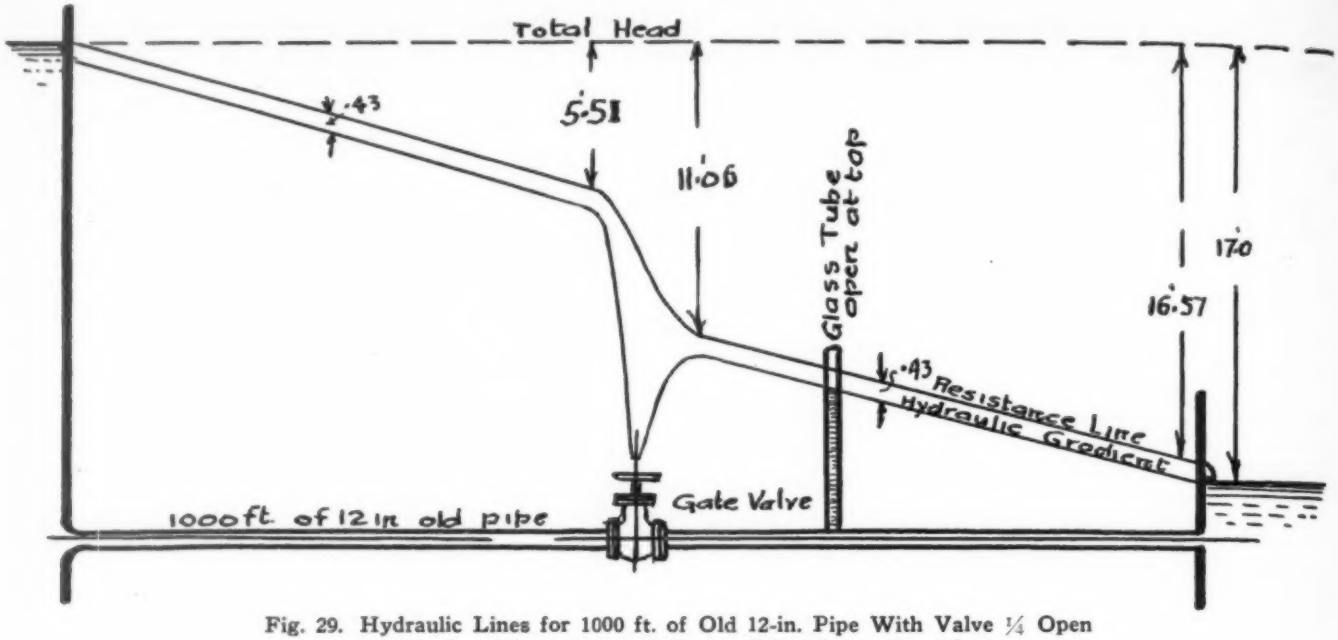


Fig. 29. Hydraulic Lines for 1000 ft. of Old 12-in. Pipe With Valve ¼ Open
(*Note how the pressure falls precipitately at the valve*)

done by the Board of Fire Underwriters, who give for each size of town the number of fire streams of given size, and attached to a specified length of 2½ in. hose, which must be available at any point where a fire occurs. For instance, in Canada they require that in a town of 10,000 inhabitants provision is to be made to supply eight standard fire streams, each of which must be able to deliver 250 U. S. gallons per minute through a 1⅛ in. nozzle on the end of a single line of 2½ in. rubber-lined fire hose 250 ft. long, and it is our concern to find the hydrant pressure necessary for this effect and also to find the size of main necessary.

A hydrant with one such stream is shown on Fig. 30 and an enlarged view of the play pipe and nozzle is also shown. The area of the 1⅛ in. nozzle is 0.00691 sq. ft. and for the discharge of the 250 gal. per min. the velocity is 80.5 ft. per sec. with a corresponding velocity head of 101 ft., while for the 2½ in. hose the numbers are 16.4 ft. per sec. and 4.18 ft. (Table I and Fig. 12* will be found helpful in getting these results.)

Taking Sections 1, 2, 3 and 4 at the points shown on the drawing in Fig. 30, it will be assumed that the barrel of the hydrant is so large that the velocity head in it is relatively negligible. (For instance, if the body of the hydrant has a net area equivalent to that of a pipe 5 in. in diameter, the velocity in it will be only 4.1 ft. per sec. for which the velocity head is only 0.25 ft., which is relatively insignificant in this problem.) It is also fair to assume that the hydrant is well made and that the entrance to the outlet where the hose is attached offers little source of loss.

**TABLE I**

**Velocities in Pipes**

| Pipe size (in.) | Actual diam. (in.) | Area (sq. ft.) | Velocity ft. per sec. for 100 U. S. gal. per min. | Pipe size (in.) | Area (sq. ft.) | Velocity ft. per sec. for 1,000 U. S. gal. per min. |
|---|---|---|---|---|---|---|
| 1 | 1.049 | .00600 | 37.1 | 4 | .0873 | 25.50 |
| 1¼ | 1.25 | .00852 | 26.2 | 6 | .1963 | 11.33 |
| 1½ | 1.50 | .01227 | 18.2 | 8 | .349 | 6.37 |
| 2 | 2.067 | .0233 | 9.6 | 10 | .545 | 4.07 |
| 3 | 3.068 | .0513 | 4.3 | 12 | .785 | 2.83 |

1,000 U. S. gallons per minute = 1.44 million gallons per 24 hours. One cubic foot per second (1 cfs.) = 450 U. S. gallons per minute (450 gpm.)

Applying the principles already established gives the equation

$$1.5 + p_1 = 2 + p_2 + 4.18.$$
$$= 3.5 + p_3 + 4.18 + F \text{ (up to 3).}$$
$$= 4 + 101 + F \text{ (in hose \& nozzle)}$$

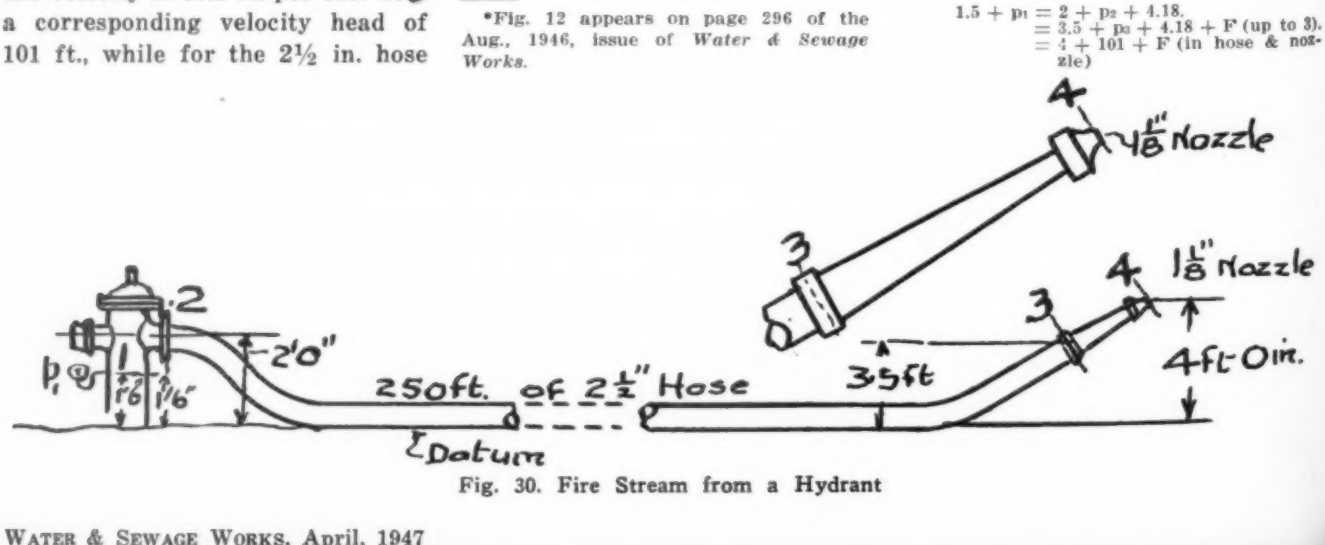


Fig. 30. Fire Stream from a Hydrant

*Fig. 12 appears on page 296 of the Aug., 1946, issue of *Water & Sewage Works.*

The friction loss up to Section 3, that is in the hose, is

$$f \frac{l}{d} \times 4.18$$

where l is 250 ft. and d is 0.208 ft., which makes this loss 5024.f ft. The friction factor f for iron pipe of this size and velocity is given as close to 0.022 in Table II, but best grade rubber-lined hose is undoubtedly smoother than the iron pipe and it would probably be quite accurate to take a value of f at 15 per cent lower than the tabular value; 0.0184 will, therefore, be used. This will give the loss in the hose alone as $0.0184 \times 5024 = 92.3$ ft.

Many experiments on the fireman's play pipe and nozzle show that for the sizes ordinarily used with single lines of hose the loss of head in the play pipe and nozzle is almost exactly equal to the velocity head in the hose, which is 4.18 ft. in this case. The total friction loss, then, from the hydrant to the discharge end of the nozzle is 92.3 + 4.18 or 96.5 ft. To get the hydrant pressure $p_1$ it is only necessary to write the equation in the form

$$1.5 + p_1 = 4 + 101 + F = 4 + 101 + 96.5,$$

or the hydrant pressure $p_1$ is 200 ft. or 86 lb. per sq. in. Since the velocity head in the jet is 101 ft., that

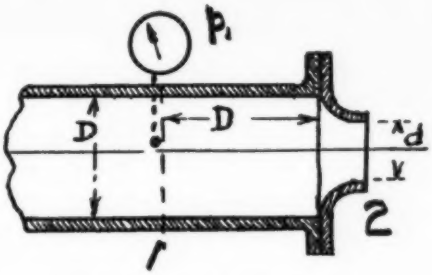


Fig. 31. Nozzle Arranged for Measuring Discharge

is the theoretical height of the highest drops in the stream is directed vertically upward in still air, some of them would go nearly that high, but as an effective fire stream it would not reach over 70 ft. in height.

Where the nozzle is used for other purposes the play pipe is not required and the nozzle is frequently fastened to the end of a pipe or inserted somewhere along its length as shown on Fig. 31 for the first case and if carefully made with well rounded entrance the loss in it is very small indeed. It is frequently used for measurement of discharge, but if great accuracy is desired, the shape of the nozzle should be that used by the American Society of Mechanical Engineers or some other authority, where the coefficients have been determined by experiment. Such nozzles have a cylindrical exit end about one diameter long, but consideration of this use of the nozzle will be left for the next article.

Often small nozzles are used on large pipes or tanks to produce jets for fountains or for other purposes such as sprays. If a definite solid stream is desired, the nozzle must be smooth and with well-rounded entrance, in which case the velocity of the stream leaving the nozzle is about 97 per cent of the theoretical value. Thus if a one-half inch nozzle is attached to the side or top of a large pipe or tank in which the pressure, corrected to the level of the nozzle, is 10 lb. per sq. in. or 23.1 ft. of water as shown by gage, the velocity of the water where it leaves the nozzle will be approximately $0.97\sqrt{64.3 \times 23.1}$ or 37.4 ft. per sec., and as the area of the half-inch opening is 0.00136 sq. ft., the discharge will be $0.00136 \times 37.4 \times 450$ or 22.9 gal. per min., since one cubic foot per second is the same as 450 gal. per min. The jet should rise well over 20 ft. unless there is a wind to break it up.

Where it is desired to make a spray instead of a solid jet, the shape of the nozzle must be much modified and must be designed by experiment.

## Twenty-Ninth Texas Water Works & Sewerage Short School

The twenty-ninth Texas Water Works and Sewerage Short School was held at College Station, Texas, on February 10-13, 1947. This annual short school was once again extended to cover four days and was given in cooperation with the State Board of Health, State Board for Vocational Education, and the Texas A&M College. The registration, excluding guests, totaled 430.

The first session was welcomed by President Gibb Gilchrist of Texas A&M and at this session Dr. F. E. Giesecke presented a paper on "The Role of Research in Water and Sewage Treatment." F. M. Ehlers, State Sanitary Engineer of Texas and Secretary of the short school, presented a discussion of the paper. All other sessions were held as sectional meetings for water and sewage plant operators for all grades.

The joint evening session of all District Water Works and Sewerage Associations was presided over by Joe B. Winston, President of the Short School, and the speakers were N. T. Veatch, Vice Pres. of the A.W.W.A., who gave a paper on "Community Responsibility and Public Relations for the Water Works Superintendent," and W. H. Wisely, Executive Secretary of the Federation, who presented a discussion on "Community Responsibility and Public Relations for the Sewage Works Superintendent."

During the course of the school, the honor roll of Texas water works and sewage works systems was reported and special plaques were presented to the city of Henderson for having the most attractive water plant, and to Carthage for its greatest improvement in its water supply system; to Rodd Field of the U. S. Naval Air Station at Corpus Christi for the best sewage effluent; and to the City of West University Plant for the greatest improvement to its sewage treatment plant.

J. B. Winder, Chief Engineer, Water Works and Sewage, Dallas, was presented a life membership, as was Professor S. R. Wright of A&M College. Mrs. Earl H. Goodwin, Assistant Secretary-Treasurer of the short school for the past fifteen years, received a $100 government savings bond, and the Attendance Award went to the Caprock Water and Sewerage Association.

Also during the week, the A. W. W. A. members met and heard a report from Secretary L. A. Jackson, Manager-Engineer of Little Rock, Ark. At this same meeting Dean Edward R. Stapley of Oklahoma A&M College spoke on "The Aims and Objectives of the A.W.W.A."

Officers for the short school for the ensuing year are: President, S. L. Allison, Corpus Christi; First Vice-Pres., N. E. Trostle, Temple; Second Vice-Pres., E. J. Umbenhauer, El Paso; Third Vice-Pres., R. M. Dixon, College Station; Fourth Vice-Pres., K. V. Stutts, McCamey. V. M. Ehlers of Austin was reelected Secy. and Mrs. Earl H. Goodwin, Asst. Secy.-Treas.

# CURVE FOR DETERMINING FLOW IN COMPONENTS OF PARALLEL PIPE SYSTEMS

By JOHN J. BAFFA
Consulting Engineer
NEW YORK CITY

THE calculation of flow available through each component of parallel pipe systems is often necessary for distribution system reinforcement problems and for new system designs. The accompanying curve readily permits the calculation of the percentage of total flow for each element of two pipe or multiple pipe parallel systems. The curve is based upon the use of "flow resistance factors" for the determination of relative resistance to flow of each component. The "flow resistance factors" are those commonly used with the Hardy Cross Method of analysis.

It is believed that the use of this curve and the formulae connected therewith are of value in permitting the designer to deal with the actual physical elements involved in a problem. A direct approach toward the solution of many practical small-system problems is thus provided since the effect, on the system as a whole, of an alternate pipe size, pipe lining, main cleaning or coefficient depreciation for any component may be readily evaluated by reason of change in its "flow resistance factor."

### *Derivation*

The fundamental law of flow is taken to be the familiar:

$$h = r\,Q^n \qquad \text{Eq. (1)}$$

where h = head loss in feet per 1000
r = flow resistance factor
Q = discharge in gallons per minute
n = 1.85 (Hazen and Williams value)

In Table I are given the values of $r \times 10^5$ for 1000 feet of main with Q in gallons per minute.

In Fig. 1 is shown a two pipe parallel system. Each leg in turn comprises three elements of different flow resistance value. The total resistance for path No. 1 is

$$r_1 = r_a + r_e + r_f \qquad \text{Eq. (2)}$$

and for path No. 2 is

$$r_2 = r_a + r_b + r_c \qquad \text{Eq. (3)}$$

The percentage of total flow which will travel through path No. 1 is

$$P_1 = \frac{Q_1}{Q} \times 100 \qquad \text{Eq. (4)}$$

The Author

and for path No. 2 is

$$P_2 = \frac{Q_2}{Q} \times 100 \qquad \text{Eq. (5)}$$

Since the head loss between inlet and outlet is the same for both paths, it can be demonstrated by simple algebra that

$$P_1 = \frac{1}{1 + \left(\frac{r_1}{r_2}\right)^{1-n}} \qquad \text{Eq. (6)}$$

$$P_2 = \frac{1}{1 + \left(\frac{r_2}{r_1}\right)^{1-n}} \qquad \text{Eq. (7)}$$

Thus the curve in Fig. 5 is plotted with ratios $\frac{r_1}{r_2}$ as abscissas and percentages of flow through paths No. 1 as ordinates. The curve is set up so that the path with least resistance should always be considered as path No. 1 or, in other words, so that the value of $r_1$ divided by $r_2$ is always a fraction. This procedure eliminates the necessity for extending the abscissa scale for values greater than 1.0 and permits greater accuracy of curve reading for page size requirements. The curve in the upper right hand corner of Fig. 5 represents enlargement of that portion of the parent curve for resistance ratios between zero and 0.10.

### *Example*

Fig. 2 shows diagrammatic representation of a typical problem. It is required to find $Q_1$ and $Q_2$. The total flow resistance factor for $Q_2$ is $r_2 = 4.82 + 3.00 + 0.60 = 8.42$ and the total flow resistance factor for $Q_1$ is

$$r_1 = 1.70 + 1.20 + 0.17 = 3.07$$

The factor ratio $\frac{r_1}{r_2}$ is $\frac{3.07}{8.42} = 0.36$.

From the curve Fig. 5 with a resistance factor ratio of 0.36 the percentage of flow that will follow the path of least resistance is 63.2 per cent.

TABLE I

-Values of r for 1000 Feet of Pipe Based on the Hazen-Williams Formula

| Pipe Diameter, Inches | C = 90 | 100 | 110 | 120 | 130 | 140 |
|---|---|---|---|---|---|---|
| 4 | 300 | 248 | 208 | 177 | 153 | 133 |
| 6 | 41 | 33.7 | 28.4 | 24.2 | 20.9 | 18.2 |
| 8 | 10 | 8.4 | 7.0 | 6.0 | 5.2 | 4.5 |
| 10 | 3.4 | 2.8 | 2.4 | 2.0 | 1.7 | 1.5 |
| 12 | 1.5 | 1.2 | 1.0 | .83 | .71 | .62 |
| 14 | .66 | .55 | .46 | .39 | .34 | .30 |
| 16 | .35 | .29 | .24 | .20 | .18 | .15 |
| 18 | .20 | .16 | .14 | .12 | .10 | .09 |
| 20 | .12 | .10 | .08 | .07 | .06 | .05 |
| 24 | .049 | .04 | .03 | .03 | .02 | .02 |
| 30 | .016 | .013 | .011 | .010 | .008 | .007 |
| 36 | .0067 | .0054 | .0046 | .0039 | .0034 | .0030 |

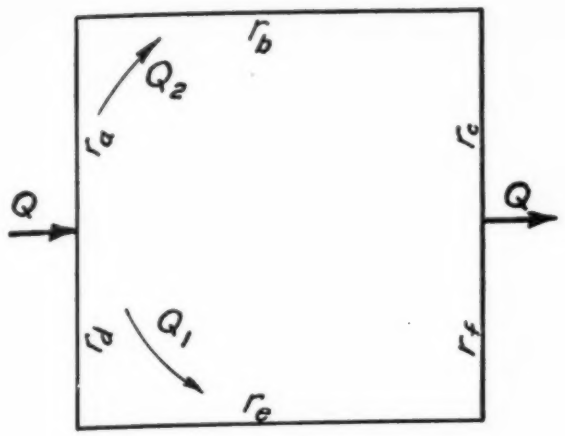


Figure 1

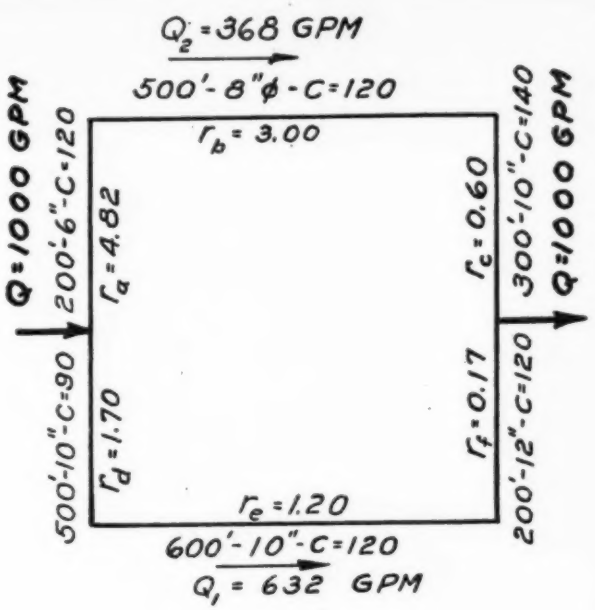


Figure 2

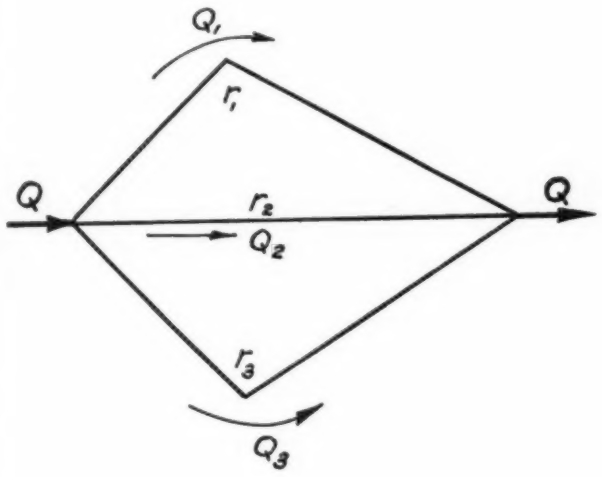


Figure 3

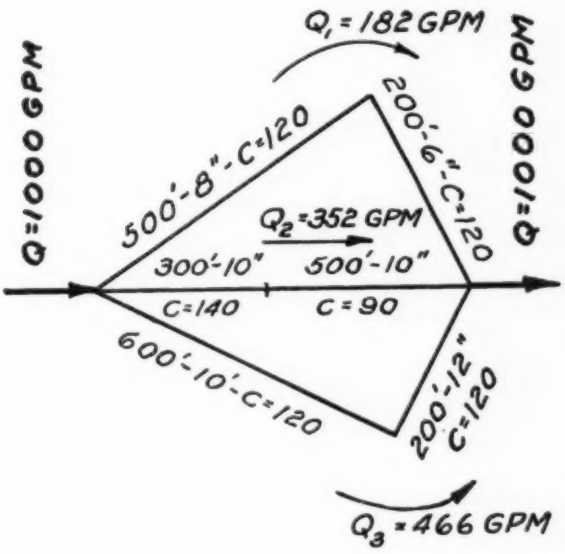


Figure 4

**Figs. 1-4. Examples of Parallel Pipe Systems**

so that $Q_1$ equals 632 gpm. and $Q_2$ equals 368 gpm.

With the flows determined, the head loss for each element may, of course, be readily obtained from the Hazen and Williams tables or directly from the relationship

$$h = rQ^{1.85}$$

utilizing table of the 0.85 power of numbers.

### *Systems With More Than Two Branches*

For systems with more than two branches a similar solution is possible. For the system shown in Fig. 3 the head loss between common inlet and common outlet is

$$H = RQ^n \qquad \text{Eq. (8)}$$

where R is the total overall resistance factor for the system. It can be demonstrated by simple algebra that for m pipes in parallel

$$\frac{1}{R^{1-n}} = \frac{1}{r_1^{1-n}} + \frac{1}{r_2^{1-n}} + \frac{1}{r_3^{1-n}} + \ldots \frac{1}{r_m^{1-n}} \qquad \text{Eq. (9)}$$

Thus for the system in Fig. 3 equation 9 may be written as

$$\frac{1}{R^{1-n}} = \frac{1}{r_1^{1-n}} + \frac{1}{r_{23}^{1-n}} \qquad \text{Eq. (10)}$$

wherein

$$\frac{1}{r_{23}^{1-n}} = \frac{1}{r_2^{1-n}} + \frac{1}{r_3^{1-n}} \qquad \text{Eq. (11)}$$

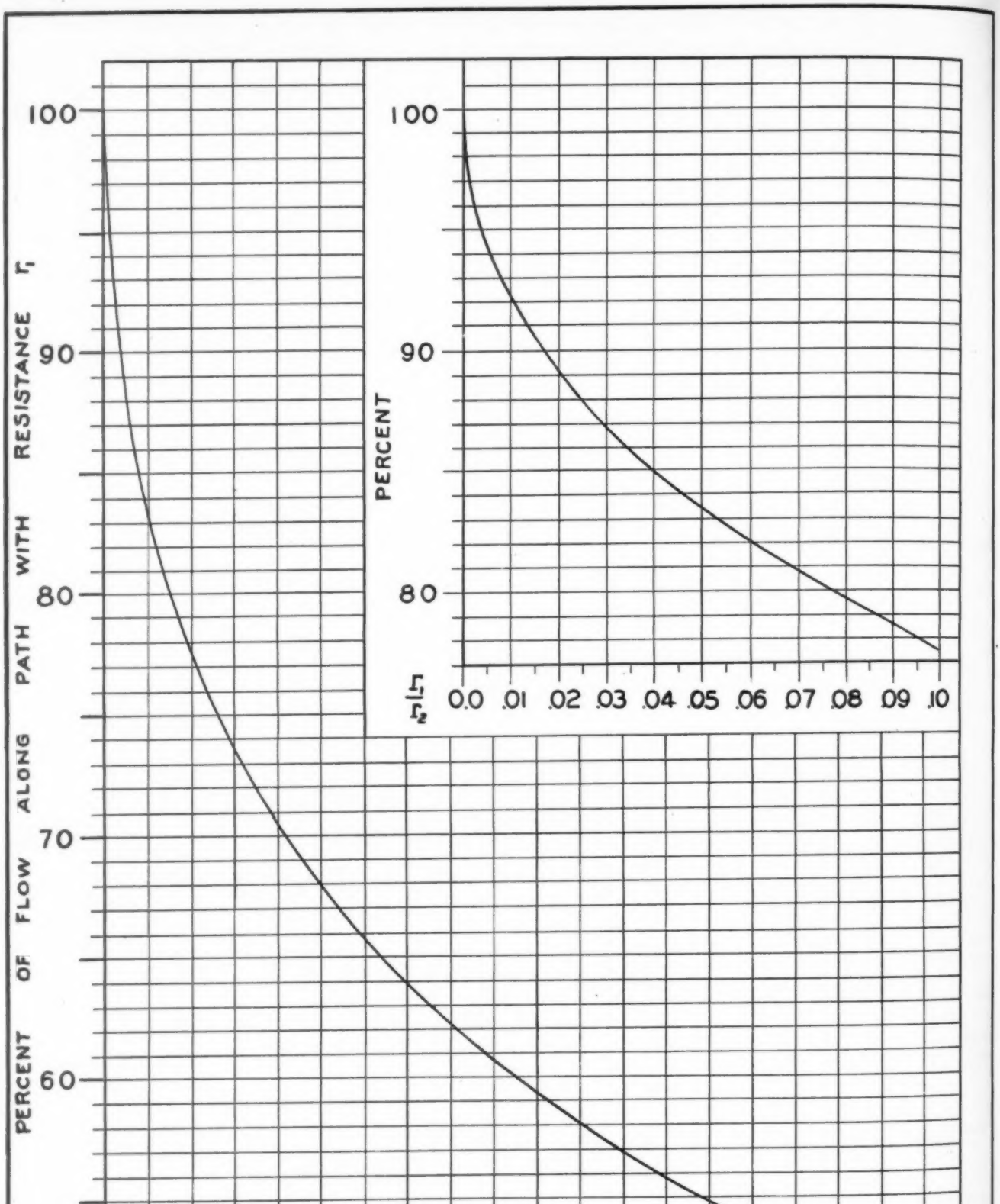


Fig. 5. Curve for the Determination of Flow in Components of Parallel Pipe Systems

Thus

$$P_1 = \frac{Q_1}{Q} \times 100 = \frac{1}{1 + \left(\frac{r_1}{r_{23}}\right)^{1.85}} \times 100 \qquad \text{Eq. (12)}$$

$$P_{23} = \frac{Q_2 + Q_3}{Q} \times 100 = \frac{1}{1 + \left(\frac{r_{23}}{r_1}\right)^{1.85}} \times 100 \qquad \text{Eq. (13)}$$

$$P_2 = \frac{Q_2}{Q} \times 100 = P_{23} \times \frac{1}{1 + \left(\frac{r_2}{r_3}\right)^{1.85}} \qquad \text{Eq. (14)}$$

$$P_3 = \frac{Q_3}{Q} \times 100 = P_{23} \times \frac{1}{1 + \left(\frac{r_3}{r_2}\right)^{1.85}} \qquad \text{Eq. (15)}$$

Equation 11 is readily solved by a chart prepared by J. R. Arbuthnot (Ref. 2) or with tables of the 0.54 and 0.85 powers of numbers. The percentages for determinations of flows for each branch can be read directly from the curve in Fig. 5. As indicated by the above equations, the three branch system is considered as a two branch system comprising one single pipe leg and one double pipe leg and the double pipe leg comprising a two branch system. Similarly a four branch system can be considered as comprising two-two branch systems in parallel, and so on.

### *Example*

Fig. 4 shows diagrammatic representation of a typical problem. It is required to find $Q_1$, $Q_2$ and $Q_3$.

$r_1 = 3.00 + 4.82 = 7.82$
$r_2 = 0.60 + 1.70 = 2.30$
$r_3 = 1.20 + 0.17 = 1.37$

$$\frac{1}{(r_{23})^{0.54}} = \frac{1}{(2.30)^{0.54}} + \frac{1}{(1.37)^{0.54}}$$

$$r_{23} = 0.48$$

$$\frac{r_{23}}{r_1} = \frac{0.48}{7.82} = .061$$

From Fig. 5

$$P_{23} = 81.8\%$$

Therefore

$Q_2 + Q_3 = 818$ gpm.
$Q_1 = 182$ gpm.

From Fig. 5 read 56.9 per cent for

$$\frac{r_3}{r_2} = \frac{1.37}{2.30} = .594$$

Hence $Q_3 = 0.569 \times 818 = 466$ gpm.
$Q_2 = 818 - 466 = 352$ gpm.

### *References*

(1)—The Hardy Cross Method
By D. R. Taylor
*Waterworks & Sewerage* Reference and Data, 1943

(2)—Chart for Determination of Equivalent Pipes
By J. R. Arbuthnot
*Water and Sewage Works*
August, 1946

## Boyd Bennett to Become City Mgr., Clearwater, Fla.

Boyd A. Bennett, President of the Water Utilities Service Corp., New York City, will retire on May 1 from that position to become City Manager of Clearwater, Fla.

**Boyd A. Bennett**

Born in Linesville, Pa., and a graduate of Denison University, Mr. Bennett has had a long and extensive experience in engineering and city management. Among the many positions in municipal and engineering work which Mr. Bennett has held are those of Assistant City Engineer and City Engineer of Conneaut, Ohio; City Engineer and Assistant City Manager of Lynchburg, Va.; Supervising Engineer with the AEF in France in World War I; City Manager of Charlottesville, Va., and City Manager of Bluefield, W. Va.

Prior to World War I, Mr. Bennett engaged in general contracting for ten years. In 1929 he joined the Public Works Engineering Corps of the Federal Water Service Corp. and was appointed Vice-Pres. of South Bay Consolidated Water Co., and Assistant Vice-Pres. of New York Water Service Corp. and subsidiaries that same year. In 1937 Mr. Bennett became President of the Northeastern Water and Electric Service Corp., which is a holding company. While continuing in that position, Mr. Bennett also became President of the Water Utilities Service Corp., New York, a subsidiary of the holding company, which utility service corporation manages many water and other utilities in the group, some 45 included.

Mr. Bennett has been a member of A.W.W.A. since 1937 and has been active on the Finance Committee of that association. He is also a member of A.S.C.E. and the U. S. Chamber of Commerce, and Engineers' Club.

## A Comment on Pump Packings

In a discussion of the "Maintenance of Sewage Pumps" before the North Dakota Water and Sewage Works Assn., John B. Kleven, Supt. of Sewage Treatment at Grand Forks, N. D., pointed out that "The most important, yet least understood, fact regarding centrifugal pump packings is that the packing gland around the shaft is supposed to leak or dribble. When the contact between the packing and the rotating pump shaft is tight enough to prevent some leakage, the packing, the shaft, or both are obliged to suffer damage. Furthermore, operators should follow closely the recommendations of the pump manufacturers when purchasing packing materials for centrifugal pumps. From the approved packings the operator should settle on those which have proved best by test in his own plant service. Experience under Grand Forks conditions indicates that braided asbestos packing impregnated with graphite to be the best overall packing."

## Charlie Fox Retires

On February 1, Charles L. Fox of the Pennsylvania Water Co., Wilkinsburg, Pa., reached the retirement age. At the time of his retirement, Mr. Fox held the positions of Vice-President, Chief Engineer, General Superintendent, and Purchasing Agent of the company.

**Charles L. Fox**

A graduate of Rensselaer Polytechnic Institute in June, 1902, Charles Fox joined the Pennsylvania Water Co., as an inspector on July 1, 1902. At that time the company was but 16 years old, and much of the progress of the past 45 years has been due to the efforts of Mr. Fox.

Mr. Fox is a life member of A.W.W.A., a Past-Chairman of the Western Section of A.W.W.A., from which section he received the 1946 Fuller Award; Fox is also a member of the Executive Committee of the Pennsylvania Water Works Operators' Association.

# GOOD PUBLIC RELATIONS—THE WATER WORKS SUPERINTENDENT'S RESPONSIBILITY TO HIS COMMUNITY*

By N. T. VEATCH
Consulting Engineer
KANSAS CITY, MO.
*(President-Elect, A.W.W.A.)*

A WELL executed public relations program is a responsibility every water works superintendent owes his community. It is equally true that the community itself has a responsibility to the water works but this covers mainly the matter of providing funds in the water works system, and paying for water furnished, and will not be discussed further; it is the responsibility of the superintendent with which we are concerned.

It is well known that there are certain responsibilities in connection with the operation of water works and these have been generally understood and accepted by water works operators. Some of these responsibilities are:

(1) Providing an ample supply of pure, wholesome water, available in sufficient quantities, and under adequate pressures to meet all reasonable demands.

(2) Providing for proper maintenance.

(3) Arranging for enlargements and extensions, far enough in advance of their need to insure proper and continuous service.

(4) Seeing that collection of accounts and disbursements is handled properly.

(5) Preparation of routine reports to city or company officers.

(6) Training of employees and development of a well organized and efficient personnel.

### *Public Relations a Responsibility*

The above list gives only a few of the many responsibilities assumed by operators and executives, as a matter of course, and are mentioned only for the purpose of contrast with another type of responsibility, which is usually referred to as "Public Relations."

There has been a growing realization among those connected with the water works industry, that proper and efficient discharge of responsibilities such as those mentioned above, does not in itself, fulfill all of the obligations of the water works operator or executive. His business is serving water to people and, therefore, people (his customers) deserve attention, as well as his physical plant. Many of you no doubt can recall instances where good "Public Relations" presented more of a problem to you, than the operation of your system.

The Author

We can all look with pride upon the remarkable technical advances which have been made in the art of developing and distributing water supplies. The advance has truly been phenomenal, and so much so that the public has grown to look upon water a good deal as it does on the air it breathes; just a natural consequence of community life. Realizing that generally speaking little or no attention has been given to the human relationships which exist between plant operators and the people being served, the American Water Works Association, which has contributed much technically, has undertaken a program, the purpose of which is to assist its members and the industry generally in bringing about better public relations. Many of you are no doubt members of the A.W.W.A. and are receiving the literature being sent out under the apt and expressive slogan "Silent Service is Not Enough."

The American Water Works Association has also made plans for setting up a broad committee program which will function under a committee to be known as "Committee on Water Works Administration," and which, it is hoped and believed, will contribute as much to the industry, as its "Committee on Water Works Practice" has done technically.

These activities, of the American Water Works Association, are mentioned mainly to show that the matter of "Public Relations" is receiving national attention, and to acquaint A.W.W.A. members with what is being done to help them and the industry generally.

### *Water Works Industry Is Big Business*

It may be helpful, in approaching the matter of "Public Relations," to review the water works industry as a whole. Some of the data may be useful to you and it is believed the realization of the importance of the industry in our economic life, cannot help but give you a feeling of pride in being a part of it. The following statistical data are impressive.

(1) A capital investment in excess of five billion dollars.

(2) Over 80,000 employees.

(3) Value of annual output in excess of five hundred million dollars.

(4) U. S. Public Health Service Census of 1940 showed approximately 13,000 cities and rural areas being served by public water supplies.

(5) Serves over eighty-five million people.

(6) Investment per employee $70,000.00 compared to:

| | |
|---|---|
| Manufacturing | $ 6,000 |
| Wholesale and Retail | 7,000 |
| Gas | 25,000 |
| Electric | 40,000 |

(7) Ranks 16th in number of employees and 22nd in annual value of product in a list of 178 leading industries in the U. S.

(8) Weight of product pumped and delivered each year is seven times that of products from all other industries serving our present civiliza-

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tion. Comparison with a few other industries show the following:

| | |
|---|---|
| Steel ..... | 100 million tons per year |
| Coal ..... | 700 million tons per year |
| Petroleum... | 230 million tons per year |
| Agriculture. | 250 million tons per year |
| Water ..... | 13,000 million tons per year |

In the case of the average home, the weight of water used is ten times that of all other products used.

(9) Average cost of water, about 4c per ton, compared with:

| | | |
|---|---|---|
| Butter... | @ 75c lb. | $1,500.00 per ton |
| Milk..... | @ 15c qt. | $ 144.00 per ton |
| Bourbon.. | @ 5.00 qt. | $4,800.00 per ton |

(10) At turn of century (1900), the typhoid death rate exceeded 200 per 100,000 persons. In 1925 there were 634 filtration plants of all types, whereas in 1940 there were 5,372. Typhoid death rate in 1940 had dropped to less than 1 per 100,000 people. Great advancement in other fields of sanitation such as disposal of sewage, control of milk and other foodstuffs have contributed greatly to this drop in death rate, but advancement in the art of water purification has played a most important part in improving health conditions.

So much for what the water works industry means and for its importance among industries. No industry and no individual may stand still. Movement must be forward or backward. Leading industries are continually striving for advancement and are seeking ways and means for the betterment of service as well as for the advancement of the individuals who are responsible for operation.

### *Keep Public Informed*

Many leaders, in the water works field, believe that much can be done by keeping the public informed regarding the condition of the system, the services rendered and the value to the community of the efforts of the men and women who make these services possible.

Water supply is such a vital part of community life, and the art of furnishing water has been perfected to such an extent that the average citizen accepts water service as a matter of course. He has little conception of the intricate problems involved in bringing the water to him. His thoughts in regard to water are commonly limited to the opening of a faucet, the flushing of a toilet, or the payment of a water bill. If the plant is municipally owned, he is one of the owners of the water system but, unless some one tells him about it, he is usually entirely ignorant regarding it.

Back of almost every water supply system are many interesting and complicated engineering and construction problems, many having items of great human interest. Who can inform the public regarding these matters better than the superintendent or manager of the water department? Often, a superintendent has been able to handle a difficult situation, in rendering service, because he has had the confidence of a public which has understood his difficulties. This confidence and understanding has been brought about by his past public relations. He has taken the public into his confidence by keeping it informed of his problems and his accomplishments.

It should be remembered that the individuals to whom water service is rendered are the same as those who will be asked, at times, to pass on bond issues for system enlargements and to elect city officials with whom the superintendent must work.

There are many outstanding examples, throughout the country, of superintendents and managers of water works properties, who have been able to develop their physical plants, and enhance their personal interests, largely through the channel of good public relations. Taken as a whole, however, the water works industry has not emphasized "Public Relations" as much as many other industries and it is believed that by not doing so, the individuals involved have suffered. There are many cities where the water works executives are little known among the citizens of the community. This is often due to the fact that emphasis has been placed upon the physical perfection of the water works system itself, and little attention has been paid to the public. Pride in a fine plant, producing an adequate and safe water supply is natural and unavoidable, but an executive who does not take care of the public relations of his property, is handicapping not only the advancement of his physical plant, but, what is of more importance to him, his individual advancement. In other words "Silent Service is Not Enough."

### *Value of Good Public Relations Obvious*

The value of good public relations in any line of endeavor seems too obvious for argument and is particularly obvious when as vital a commodity as water is involved. Possibly the reason that this has not been given more consideration in the water works industry is that so much attention has of necessity been given to the engineering features that it has given rise to the feeling that other things are relatively unimportant.

This is wishful thinking and neglects the items involving human relationship, such as: (1) Satisfaction with rates charged for service; (2) Satisfaction with quality, quantity and pressures; (3) Understanding of reasons for necessary plant enlargements, extensions, etc., and last but not least, an understanding of just what service the water works operator or executive is constantly rendering the community. The last mentioned item is of vital concern to all employees of a water department, particularly to the man in charge.

The average customer is busy with his own affairs and gives little attention to the water department unless something goes wrong or his pocket book is affected. He is called upon at times to vote upon bond issues for water works improvement. At such times, efforts are usually made to acquaint the voter (customer) with the details of, and reasons for, the proposed expenditure, but often arguments spring up and sometimes the issue is beclouded by emotion and his judgment is prejudiced. How much better it would be to have kept the customer informed over a long period of time as to the physical condition of the property and the probable needs for enlargement and betterment? Such a plan would have avoided the danger of a negative vote due to lack of correct information, and would disarm the negative pressure groups which always seem to be present regardless of the worthiness of the project?

### *What Are Public Relations?*

Assuming that a water works operator or executive is interested in the matter of "Public Relations," the question of just what to do, and how to go about it, will undoubtedly arise. "Public Relations" as the name implies, involves relationship with the public, which is made up of almost as many different personalities as there are people. Also, communities have different problems, different civic prides, different aggressiveness, etc., and therefore fall into many and varying types. It is impossible for anyone to outline a fixed and hard outline of the best means to follow in developing "Public Relations." There are certain general

suggestions which can be applied in varying ways in different communities, but the best plan in any one city must be determined by the water works executive after a careful study of his particular problem and by a candid analysis not only of the system he is operating but of his own abilities and shortcomings. Each individual will have abilities along some of the different routes that can be followed and the best plan in any one place will be that in which the character of the community and the abilities of the individual are best reconciled.

The human relationships of a water works executive exist in three distinct groups:

Relations with employees.
Relations with public officials.
Relations with the public.

The development of good public relations should start with the employees and then extend to public officials, as relationship with the public cannot be entirely successful without the help of these two groups. The spirit of your organization is most important from the standpoint of establishing sound public relations. The organization should first be selected from the best talent available and then a definite effort should be made to develop a high degree of loyalty to the system and to the department. There are a number of ways that this can be done and different individuals in the organization have to be handled differently but if care and thought are given to the matter, it should be possible to develop a real instrument of usefulness in the operating personnel. Each member of the organization has friends and relatives and his circle of influence may be wider than realized. In other words, it is well to get one's own house in order before branching out and trying to sell the water department to the public.

### *Existing Accounting Methods A Reflection on Many Municipal Water Works Managements*

With the organization operating efficiently with a high degree of loyalty and enthusiasm, it is usually not much of a task to obtain the support and good will of the city officials. Here are frequent chances of contact and every effort should be made to keep them thoroughly informed in regard to problems and accomplishments. A good many departments could improve their standing with city officials and the public as well, if thought were given to the manner in which the accounting is handled. The accounting systems followed in many of the water departments make it difficult, if not impossible, to really know what costs of operation are, and to compare operations with those in other cities. If the accounting is not now being done in accordance with one of the better standard systems of accounting, it would bring credit to the superintendent and to the department if such an accounting system were installed.

When good relationships have been established between the water department and the city officials, the ground work is laid for public relations. There are many ways of contacting the public, the most common, least expensive, and most direct ones being through the local newspapers and in appearances before local groups or organizations. It usually pays to cultivate the press. These people are interested in public relations also, and they will be glad to publish any information that is news to its readers. Every opportunity that presents itself to talk about the water works system before different civic groups should be welcomed and in many instances there is no harm in asking the leaders of such groups if their membership would be interested in knowing about the city water works. In most cases the answer will be favorable. The secret of good public relations is to take the public into *full* confidence, employing correct and honest statements even though they may in some instances be bad. Customers should be made to feel that they are being treated as part owners in the system, which in most cases they are. It is not intended that you, as a water superintendent, or manager, should become in any sense a "hawker" for the water works system, but by carefully planned and quiet efforts, it will be possible to get and keep the interest of your customers in your problems and in what you are doing. Through such a plan, you will save yourselves a great many headaches and enhance your own standing. And this, in most cases, does not go unrewarded.

## New Anti-Aircraft Weapon?*

The Fort Jackson, S. C., Sewage Treatment Plant demonstrated considerable possibilities as a new secret weapon against aircraft by bringing down an Army liaison plane on the afternoon of January 24, 1947. The plane fell immediately after taking off from a nearby flight strip.

"Major Stinky," as the pilot is now known, was unhurt; his passenger suffered minor cuts. Although the plane was seriously damaged, injury to the clarifier was small.

Personnel of the treatment plant have devoted considerable speculation and thought to the idea of developing the plant into a reliable anti-aircraft weapon but can report little progress to date. In the general excitement no effort was made to make a detailed analysis of chemical, biological and physical conditions in the plant from which the most effective factor might have been deduced.

Efforts to solve the problem have come to a standstill as it is believed that the Army would be very reluctant to furnish other planes and pilots for additional plant-scale experiments.

**"Airplane Trap"**
*Normally the Final Clarifier, Ft. Jackson's Treatment Plant*

*Contributed by George A. Rhame, Supt. Ft. Jackson, S. C., Sewage Works.

# WHY HAVE OPERATORS IN WATER FILTRATION PLANTS?

By A. E. CLARK
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NASHVILLE, TENN.

IN a previous article (*Water & Sewage Works*, Aug., 1946) the classification of "operator" was listed as one of the group of employees necessary to the functioning of a water filtration plant. Webster defines an operator as "one who operates." This definition is correct, but does not include many other duties usually delegated to the operator as he is known in the water works field. The term operator is also applied to many other trades and the layman often thinks of an operator as one who operates machinery or equipment, such as pumps, graders, compressors, elevators, etc.

Given the classification of operator, how much credit is given to the man for the type of work he does? How much credit is given him for the responsibility he shoulders in running the plant to produce the results required? Too often, not enough! It may be argued that his duties are those given him by the superintendent and that responsibility for results rests with the superintendent. This may be true to a certain extent, but the supervisor of the plant is not on actual duty 24 hours a day and during his absence operation must continue with the production of good water.

When the superintendent is not in the plant, then the operator is actually in charge. In many instances too little credit is given the operators for this fact and the operators thus have a tendency to think of their duties as routine functions requiring little thought, judgment or ingenuity. This conception is false, and if superintendents give a little thought to what they expect of operators, they, too, might be a little surprised.

It is true that there is a certain amount of routine, such as washing filters, checking quantities of chemicals used, reading meters, and so forth, but there are other duties which are not routine and should be taught, insofar as possible, under an operator's training course. Even though the training is thorough, it is often necessary for the operator to use his own judgment to size up a situation and decide best how to care for it.

Preparation for such situations cannot be taught because no one can predict when some condition may arise to require a quick decision and action by the operator. True, he has recourse to the telephone, but superintendents don't want to be called at all hours of the night to answer a question which the operator can well answer for himself, if he has been properly trained. Of course, there are some problems with which the operator may be unable to cope and for these it is the duty of the supervisor to take over.

The Author

### *Other Operator's Duties*

In addition to accepting responsibility in the absence of the supervisor, and carrying out routine duties as indicated above, the operator may be called on to make or supervise the making of physical and chemical tests on the water. These tests may be essential to the proper control of chemical dosage and treatment.

Among the tests the operator may be called on to make are pH, turbidity, color, residual chlorine, coagulation jar tests, alkalinity, etc. A *well trained* operator is taught, not only how to make these tests, but also what they mean, and how to use them to control plant operation.

For example, some water plants control alum dosage by pH determinations. In such cases the operator must understand how to use the results obtained as a guide to the adjustment of the alum dosage. In other plants the control of the final pH of the plant effluent may be an important factor. In these cases it may be that not only the alum dosage but lime dosage as well must be properly controlled. Under some conditions a certain amount of ingenuity is necessary on the part of the operator to accomplish the desired results.

As another example, consider the maintenance of a proper residual chlorine in the finished water—indeed a responsibility of moment. If automatic controls are not available this factor alone may require some considerable attention. If the newer "free residual chlorination" is being practiced or if chlorine dioxide is used, the attention required of the operator is even greater and demands more judgment. In cases where rates of flow vary, the value of an operator with good judgment and ingenuity is of even more importance.

### *Small Plant Operators*

So much for a few examples of the responsibility imposed on operators in many of the larger plants. Let us now turn our attention to the operators of small plants which operate only during the day and have a relatively small capacity. The operator of such a plant really has a responsible job, but too often the "city fathers" think of it merely as a routine job that can be handled by anyone.

If such a plant is to be properly operated to produce a finished water that meets present day standards, then the operator must be well trained. Too many times plants of this size are placed in the hands of men who have had no basic training which fits them for producing a safe drinking water for communities of 500 to 5000 population. The salaries paid in such communities is, in many instances, too low to attract a man trained in this work, or for that matter, to attract a man untrained, but capable of being trained and having sufficient interest to want to learn.

The problems of small plant operation are just as big technically as those of larger plants under technical supervision. If it is good practice to provide technical supervision in the larger plants, then it should be just as important to provide proper supervision and operation (combined) in the small plant.

As an indication that this trend of thinking is in the right direction one may point to the several state departments of health which have fostered

operator training and licensing as a means of raising the standards for operators. Short schools, personal visits by health department engineers, bulletins, etc., are other means of improving not only the standard of the operator but also his status in the community and in the profession of water treatment.

### *Provide an Incentive*

Faster progress might be made in the desired direction of improved standards for plant operators if the operators had more incentive to improve themselves. It is probably safe to say that the majority of people measure individual progress and advancement by the size of the pay envelope's contents. This is undoubtedly true of the operator of the small water plant, but he seldom sees any evidence of increasing income as recompense for an improvement in the accomplishment of his work. Monies can often be found in the small community to do a lot of things, but raising the salary of the water plant operator is usually not one of them.

On the other hand water departments usually produce a revenue sufficient to pay their own bonds, maintenance, depreciation, and operation and have money left over to go into the general fund. It would be fairer and more farsighted for the community to more adequately compensate the water department operator than to swell the general fund. Such action will provide the incentive to the operator to do an even better job than he has been doing.

From this writer's viewpoint the operator has a quite responsible job, and deserves more recognition. If the operator's talents are made use of, it will be found that he can be of a surprising amount of help to the supervisor. It is the operator who is in close touch with all operations. It is he who learns the peculiarities of the many pieces of equipment. It is he who is first to observe the changes in the raw water. It is he who is a pretty good man to have around and he should be given credit for a good job.

## Sewage Federation Shows Healthy Growth Curve

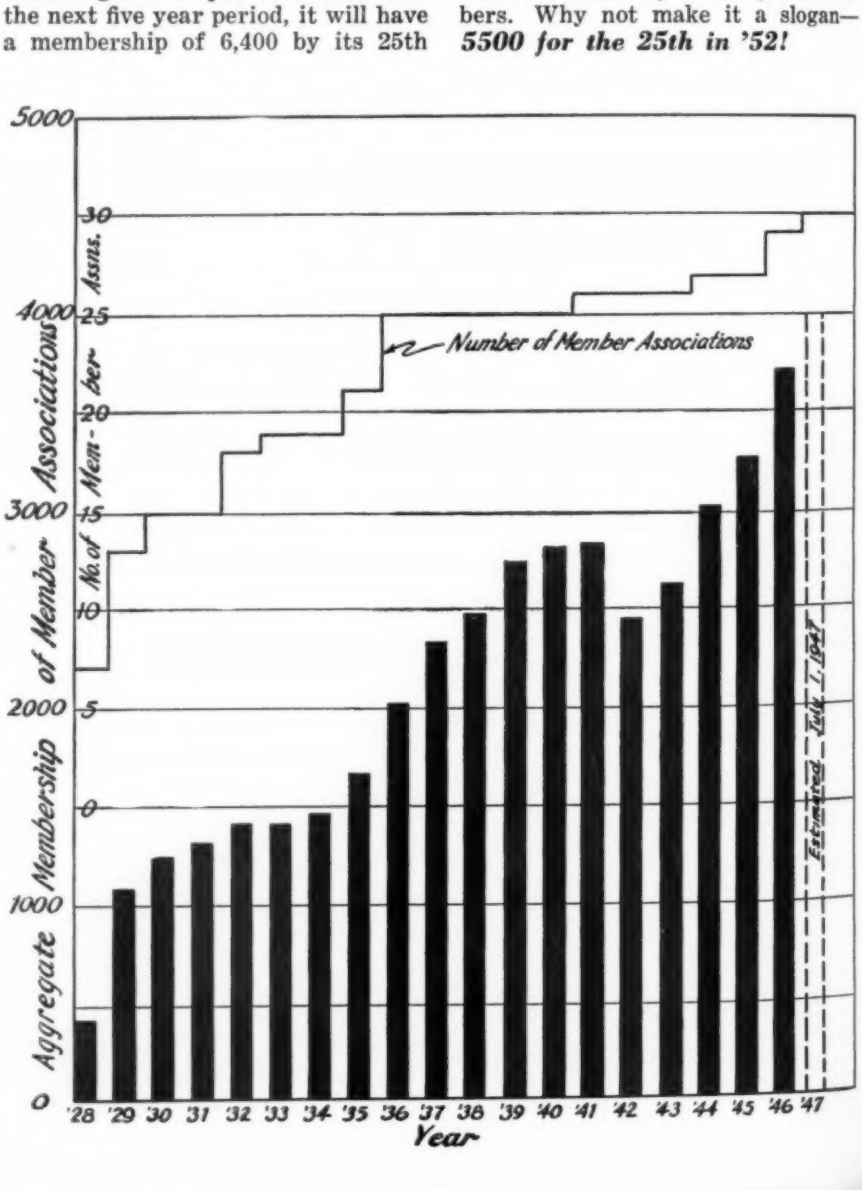
Organized just two decades ago, the Federation of Sewage Works Associations has shown a remarkable growth in aggregate membership of member associations. Except for a two year period during the war, that growth has shown a decidedly healthy trend since the reorganization of the Federation in 1940 to become an organization of international scope.

The accompanying graph shows both the number of member associations and the aggregate membership. It is of interest to note that although the number of member associations remained relatively constant during the mid-thirties, the membership growth was rapid, probably reflecting the result of the increase in new sewage treatment plants built in the 1930's.

Between 1935 and 1940 the growth in individual members was approximately 287 each year, resulting in a five year gain of 1,175 or 70.3 per cent. Unfortunately, following the reorganization of the Federation in 1940, the advent of the war put a damper on its growth and the aggregate membership actually dropped off. This was due almost entirely to the fact that many members of individual associations went into service and while carried on the member association rolls, were not reported as paid up members to the Federation.

Since 1942, the membership gain has been even more rapid than prior to 1940. It is now predictable that the aggregate membership will reach 4,000 by July 1 of this year. That figure will represent an annual average gain of 316 members, representing a 63.3 per cent gain since 1942.

This very satisfactory growth is the result of the policy of service of the Federation and its hard working secretary, W. H. Wisely. If the Federation gains 60 per cent in size in the next five year period, it will have a membership of 6,400 by its 25th anniversary. Even if the rate of gain continues only at the rate of 315 each year, the Federation will celebrate a silver anniversary with 5,550 members. Why not make it a slogan—***5500 for the 25th in '52!***



# MORE WATER AND SEWAGE WORKS PROJECTS

## Federal Loans Made Between Oct. 15 and Mar. 17 for Construction Plans

IN AUGUST 1945 *Water & Sewage Works* (then *Water Works & Sewerage*) began listing water and sewage works projects for which the Federal government had made loans for plan preparations.

Herewith the seventh such listing, this one covering the period of Oct. 15, 1946 to Mar. 15 of this year, showing 381 projects in 322 communities in 43 states.

A summary of the listings published is shown in the following tabulation:

| Issue of W. & S. W. | No. of Projects | No. of Communities |
|---|---|---|
| Aug., '45 | 77 | 61 |
| Sept., '45 | 122 | 100 |
| Nov., '45 | 206 | 165 |
| Apr., '46 | 629 | 526 |
| Aug., '46 | 423 | 346 |
| Nov., '46 | 339 | 304 |
| Apr., '47 | 381 | 322 |
| Total to date | 2,177 | 1,824 |

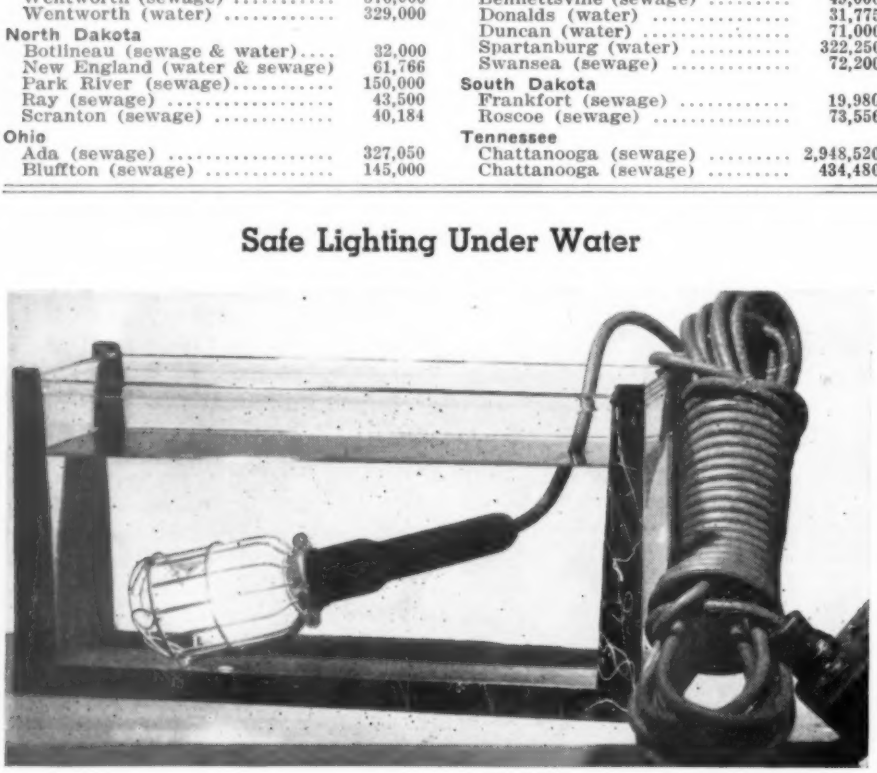
The funds for these plans are made available through the Bureau of Community Facilities of the Federal Works Agency and are to be repaid when construction is begun.

The following list shows the communities receiving the most recent loans and the estimated cost of the completed projects.

| Community and Facility | Estimated Cost |
|---|---|
| **Alabama** | |
| Atmore (sewage) | 54,500 |
| Birmingham (sewage) | 2,944,250 |
| Dozier (water) | 42,000 |
| Five Points (water) | 31,881 |
| Gilbertson (water) | 42,000 |
| Montgomery (sewage) | 70,000 |
| Montgomery (sewage) | 138,750 |
| Montgomery (sewage) | 280,000 |
| Montgomery (sewage) | 1,114,250 |
| Repton (water) | 45,000 |
| Selma (sewage) | 367,700 |
| **Arizona** | |
| Benson (sewage) | 97,600 |
| Phoenix (water) | 1,607,500 |
| **Arkansas** | |
| Dermott (sewage) | 85,000 |
| Dover (water) | 49,250 |
| Russellville (sewage) | 378,200 |
| Waterloo (sewage) | 164,380 |
| **California** | |
| Alameda (sewage) | 60,000 |
| Alameda (sewage) | 1,950,030 |
| Alturas (sewage) | 5,440 |
| Alturas (water) | 84,200 |
| Armona (sewage) | 110,080 |
| Calistoga (water) | 212,000 |
| Centreville (sewage) | 165,000 |
| Coleta (sewage) | 108,743 |
| Colfax (sewage) | 65,000 |
| Grass Valley (sewage) | 330,500 |
| King City (sewage) | 49,950 |
| Mill Valley (sewage) | 72,800 |
| Portola (sewage) | 175,000 |
| Quincy (sewage) | 175,500 |
| Ramona (sewage) | 150,460 |
| Reeding (sewage) | 43,500 |
| San Pablo (sewage) | 679,000 |
| Santa Monica (water) | 341,850 |
| Santa Rosa (water) | 1,950,030 |
| So. San Francisco (sewage) | 286,700 |
| So. San Francisco (sewage) | 302,500 |
| **Colorado** | |
| Center (sewage) | 87,000 |
| Flagler (sewage) | 89,500 |
| Kremmling (sewage) | 95,500 |
| Littleton (sewage) | 152,460 |
| Minturn (sewage) | 45,000 |
| **Connecticut** | |
| Branford (sewage) | 582,530 |
| Bristol (sewage) | 445,000 |
| Tariffville (water) | 16,140 |
| **Delaware** | |
| Lewes (sewage) | 114,000 |
| Lewes (water) | 290,000 |
| Lewes (sewage) | 296,000 |
| **Florida** | |
| Ferandina (sewage) | 194,000 |
| Fort Pierce (sewage) | 239,600 |
| Lake Worth (sewage) | 950,000 |
| Jacksonville (water) | 799,844 |
| Orlando (sewage) | 614,790 |
| Pahokee (sewage) | 197,325 |
| Quincy (water) | 140,900 |
| Starke (sewage) | 47,565 |
| St. Augustine (sewage) | 950,000 |
| St. Augustine (water) | 266,630 |
| Vere Beach (sewage) | 195,600 |
| **Georgia** | |
| Ailey (water) | 62,000 |
| Alamo (water) | 62,590 |
| Augusta (sewage) | 67,228 |
| Augusta (sewage) | 614,191 |
| Augusta (water) | 173,590 |
| Avera (sewage) | 41,750 |
| Bogart Tn. (water) | 47,000 |
| Butler (sewage) | 105,476 |
| Cedar Grove (water) | 138,750 |
| Cobbtown (water) | 31,274 |
| Comer (water) | 60,000 |
| Coolidge (sewage) | 58,288 |
| Danielsville (water) | 30,000 |
| Eastman (sewage) | 120,000 |
| Eastman (water) | 75,000 |
| Jonesboro (sewage) | 71,833 |
| Jonesboro (water) | 74,825 |
| Kennesaw Tn. (water) | 61,102 |
| McCaysville (sewage) | 96,387 |
| Meansville (water) | 29,155 |
| Milner (water) | 39,435 |
| Ocilla (water) | 40,513 |
| Perry (sewage) | 27,500 |
| Roberta (sewage) | 50,183 |
| Royston (sewage) | 103,282 |
| Royston (water) | 56,201 |
| Smyrna (water) | 85,550 |
| Springfield (water) | 54,802 |
| Stapleton (sewage) | 45,818 |
| Thomson (sewage) | 111,500 |
| Vidalia (sewage) | 50,183 |
| Washington (water) | 118,480 |
| **Idaho** | |
| Preston (sewage) | 76,245 |
| **Illinois** | |
| Albion (sewage) | 198,000 |
| Buffalo (water) | 67,400 |
| Carrier Mills (water & sewage) | 270,000 |
| Christman (sewage) | 54,650 |
| Coffeen (sewage) | 70,050 |
| East St. Louis (sewage) | 2,165,000 |
| East St. Louis (sewage) | 3,175,000 |
| Galesburg (water) | 937,655 |
| Galesburg (water) | 910,000 |
| Geneseo (sewage) | 150,100 |
| Huntley (sewage) | 154,160 |
| Joliet (water) | 3,894,000 |
| Markham (water) | 174,000 |
| Medora (sewage) | 84,950 |
| Palatine (sewage) | 173,452 |
| Sorento (water) | 72,598 |
| Taylor Springs (sewage) | 78,321 |
| Tinley Park (sewage) | 186,000 |
| West Frankfort (sewage) | 322,600 |
| **Indiana** | |
| Covington (water) | 141,438 |
| Fortville (sewage) | 145,000 |
| Ft. Wayne (sewage) | 161,675 |
| Ft. Wayne (sewage) | 779,385 |
| Hammond (sewage) | 768,880 |
| Indianapolis (sewage) | 2,720,000 |
| North Beach (sewage) | 123,965 |
| North Beach (water) | 113,735 |
| Milan (water) | 75,000 |
| **Iowa** | |
| Adair (sewage) | 107,971 |
| Adair (water) | 78,602 |
| Bondurant (water) | 38,920 |
| Davenport (sewage) | 350,615 |
| Edgerton (water) | 26,000 |
| Ireton Tn. (sewage) | 86,000 |
| Le Grand (water) | 31,722 |
| Marengo (sewage) | 100,000 |
| Mona (sewage) | 19,817 |
| Mystic (sewage) | 133,500 |
| Mystic (water) | 155,000 |
| North English (sewage) | 39,350 |
| North English (water) | 33,400 |
| Northwood (sewage) | 210,216 |
| Norwalk (water) | 49,000 |
| Rowan (sewage) | 31,080 |
| Sheffield (sewage) | 49,550 |
| **Kansas** | |
| Beloit (water) | 229,000 |
| Coldwater (sewage) | 31,180 |
| Coldwater (sewage) | 23,990 |
| Girard (sewage) | 34,000 |
| Harveysville (water) | 30,000 |
| Iola (water) | 123,763 |
| St. Francis (water) | 37,310 |
| Strong (sewage) | 78,280 |
| Wakeeney (sewage) | 79,944 |
| **Kentucky** | |
| Corbin (water) | 1,346,560 |
| Irvine (sewage) | 88,480 |
| Irvine (sewage) | 88,055 |
| Kingsley (sewage) | 65,000 |
| La Grange (sewage) | 174,504 |
| Liberty (water) | 23,500 |
| London (sewage) | 139,153 |
| Maysville (sewage) | 132,680 |
| Maysville (sewage) | 96,476 |
| Paducah (sewage) | 908,280 |
| Paducah (sewage) | 740,000 |
| Slaughter (water) | 65,000 |
| Williamsport (water) | 195,180 |
| **Louisiana** | |
| Covington (sewage) | 99,589 |
| Kaplan (sewage) | 220,000 |
| Kinder Tn. (water) | 79,871 |
| White Castle (sewage) | 90,800 |
| Winnsboro (sewage) | 141,929 |
| Winnsboro (water) | 17,127 |
| **Maryland** | |
| Baltimore (sewage) | 534,900 |
| **Massachusetts** | |
| Harwich (water) | 225,100 |
| Harwich (water) | 117,700 |
| Lexington (sewage) | 316,600 |
| **Michigan** | |
| Adrian (sewage) | 481,700 |
| Centerville (sewage) | 141,500 |
| Grand Rapids (sewage) | 1,782,408 |
| Kalamazoo (sewage) | 433,000 |
| Nashville (sewage) | 79,700 |
| Muskegon Heights (sewage) | 334,500 |
| Saginaw (sewage) | 4,717,575 |
| Saint Louis (sewage) | 70,300 |
| Standish (sewage) | 55,000 |
| Stevensville (water) | 388,136 |
| Ypsilanti Tn. (sewage) | 172,000 |
| Ypsilanti Tn. (sewage) | 118,000 |
| **Minnesota** | |
| Baudette (sewage) | 112,018 |
| Deephaven (sewage) | 320,000 |
| Pine City (sewage) | 166,019 |
| Pine River (sewage) | 90,149 |
| St. Joseph (sewage) | 61,000 |
| St. Joseph (sewage) | 43,000 |
| **Mississippi** | |
| Columbus (water) | 292,433 |
| Columbus (water) | 242,725 |
| Corinth (sewage) | 300,000 |
| Holly Springs (sewage) | 145,000 |
| Morton (water) | 63,343 |
| Natchez (sewage) | 431,393 |
| Natchez (sewage) | 203,296 |
| Natchez (sewage) | 119,179 |
| Natchez (sewage) | 58,412 |
| Natchez (water) | 258,812 |
| Ruleville (sewage) | 108,000 |
| Shaw (sewage) | 103,827 |
| West (water) | 35,989 |
| **Missouri** | |
| Boonville (sewage) | 38,000 |
| Charleston (sewage) | 320,000 |
| Green Ridge (water) | 43,000 |
| Higginsville (water) | 394,246 |
| Huntsville (water) | 77,000 |
| La Mente (water) | 53,000 |
| Pierce City (sewage) | 108,738 |
| Sweet Springs | 70,000 |
| Weston (water) | 33,000 |
| Winfield (water) | 67,372 |
| **Montana** | |
| Boulder (water) | 92,200 |
| Great Falls (sewage) | 213,986 |

| Community and Facility | Estimated Cost |
|---|---|
| **Nebraska** | |
| Axtell (sewage) | 65,955 |
| Bennington (sewage) | 41,819 |
| Brunswick (sewage) | 44,527 |
| Carleton (sewage) | 59,140 |
| Cotesfield (water) | 25,303 |
| Dodge (sewage) | 22,331 |
| Gothenburg (sewage) | 78,100 |
| Guide Rock (water) | 60,445 |
| Keith (sewage) | 52,140 |
| Louisville (sewage) | 9,997 |
| Omaha (sewage) | 6,000,000 |
| Papillion (sewage) | 49,615 |
| Rising Sun (sewage) | 58,950 |
| Scotia (sewage) | 59,761 |
| Scotia (water) | 18,433 |
| Springfield (sewage) | 55,080 |
| Wallace (sewage) | 53,928 |
| **New Jersey** | |
| Kearney (sewage) | 436,000 |
| Kearney (sewage) | 81,750 |
| **New Mexico** | |
| Bayard (sewage) | 39,800 |
| Elida (water) | 77,000 |
| Las Vegas (sewage) | 73,000 |
| Mountainair (sewage) | 126,900 |
| Roy (sewage) | 67,000 |
| **New York** | |
| Ellenville (water) | 154,570 |
| Ellenville (water) | 44,800 |
| **North Carolina** | |
| Goldsboro (sewage) | 280,000 |
| Goldsboro (water) | 480,000 |
| Goldsboro (water) | 94,000 |
| Greenville City (sewage) | 480,204 |
| Greenville (water) | 480,204 |
| Raleigh (sewage) | 1,288,000 |
| Raleigh (sewage) | 175,000 |
| Raleigh (sewage) | 53,550 |
| Raleigh (water) | 76,230 |
| Randleman (water) | 60,750 |
| Siler City (sewage) | 60,000 |
| Siler City (water) | 100,000 |
| Tabor (sewage) | 71,250 |
| Tabor City (water) | 80,600 |
| Wentworth (sewage) | 570,000 |
| Wentworth (water) | 329,000 |
| **North Dakota** | |
| Botlineau (sewage & water) | 32,000 |
| New England (water & sewage) | 61,766 |
| Park River (sewage) | 150,000 |
| Ray (sewage) | 43,500 |
| Scranton (sewage) | 40,184 |
| **Ohio** | |
| Ada (sewage) | 327,050 |
| Bluffton (sewage) | 145,000 |
| Bluffton (sewage) | 105,000 |
| Carrollton (sewage) | 165,000 |
| Coshocton (sewage) | 391,000 |
| Coshocton (sewage) | 95,300 |
| Fayetteville (sewage) | 29,350 |
| Garretville (sewage) | 296,500 |
| Kent (sewage) | 433,852 |
| Jefferson (sewage) | 28,192 |
| Lyons (water) | 60,000 |
| Maumee (sewage) | 342,000 |
| Maumee (sewage) | 253,000 |
| Maumee (sewage) | 40,000 |
| Miamisburg (sewage) | 356,000 |
| Middletown (sewage) | 1,260,000 |
| Mt. Vernon (sewage) | 390,980 |
| Nelsonville (sewage) | 113,530 |
| New Boston (sewage) | 130,500 |
| North Bend (sewage) | 85,000 |
| Peninsula (water) | 84,000 |
| Penysburg (sewage) | 248,500 |
| Sardinia (water) | 146,038 |
| Spring Valley (water) | 91,600 |
| Toledo (sewage) | 4,553,000 |
| Wellsville (sewage) | 248,000 |
| **Oklahoma** | |
| Lindsay (sewage) | 101,214 |
| Valliant (sewage) | 58,700 |
| **Oregon** | |
| Milwaukie (sewage) | 100,000 |
| **Pennsylvania** | |
| Avoca (sewage) | 337,370 |
| Baden (sewage) | 149,400 |
| Derry (sewage) | 44,500 |
| Dupont | 496,514 |
| Duryea (sewage) | 414,516 |
| Exeter (sewage) | 395,072 |
| Flemington (sewage) | 111,100 |
| Freeport (sewage) | 64,500 |
| Honesdale (sewage) | 370,030 |
| Mifflinburg (sewage) | 163,730 |
| Jenkins Tn. (sewage) | 547,686 |
| Pittston (sewage) | 258,661 |
| Pittstown (sewage) | 893,399 |
| Plains (sewage) | 1,297,000 |
| Punxsutawney (sewage) | 203,875 |
| Williamsport (sewage) | 1,425,000 |
| **South Carolina** | |
| Beaufort (sewage) | 187,000 |
| Bennettsville (sewage) | 49,000 |
| Donalds (water) | 31,775 |
| Duncan (water) | 71,000 |
| Spartanburg (water) | 322,250 |
| Swansea (sewage) | 72,200 |
| **South Dakota** | |
| Frankfort (sewage) | 19,986 |
| Roscoe (sewage) | 73,556 |
| **Tennessee** | |
| Chattanooga (sewage) | 2,948,520 |
| Chattanooga (sewage) | 434,480 |
| Clifton (water) | 100,000 |
| La Follette (water) | 480,338 |
| Livingston (water) | 37,783 |
| Waynesboro (sewage) | 87,300 |
| **Texas** | |
| Bellevue (water) | 115,530 |
| Bells (sewage) | 42,176 |
| Collinsville (sewage) | 55,058 |
| Detroit (sewage) | 45,082 |
| Detroit (water) | 149,870 |
| Dodd City (sewage) | 30,957 |
| Ector (sewage) | 28,958 |
| Galveston Co. (water & sewage) | 123,000 |
| Harris (water) | 225,000 |
| Houston (water) | 308,000 |
| Howe (sewage) | 44,974 |
| Naples (sewage) | 59,124 |
| Pleasanton (sewage) | 81,830 |
| Richardson (sewage) | 29,707 |
| Richardson (water & sewage) | 71,698 |
| Ropesville (sewage) | 55,450 |
| Ropesville (water) | 81,750 |
| Temple (sewage) | 394,203 |
| Temple (sewage) | 105,900 |
| Temple (water) | 125,900 |
| Temple (water) | 92,192 |
| **Utah** | |
| Gunnison (sewage) | 107,000 |
| Midvale (water) | 43,000 |
| Ogden (sewage) | 1,500,000 |
| Pleasant Grove (sewage) | 150,000 |
| Salina (sewage) | 58,380 |
| Salt Lake City (sewage) | 1,023,164 |
| West Jordan (sewage) | 1,125,000 |
| **Virginia** | |
| Portsmouth (sewage) | 601,900 |
| **Washington** | |
| Clarkston (sewage) | 97,750 |
| Fircrest (water) | 92,200 |
| Naches (sewage) | 113,814 |
| Stevenson (water) | 50,000 |
| **West Virginia** | |
| Huntington (sewage) | 134,600 |
| Moundsville (sewage) | 511,000 |
| Raleigh (water) | 45,168 |
| Rhodell (water) | 43,000 |
| Wheeling (sewage) | 2,078,500 |
| Wheeing (sewage) | 1,179,400 |
| Wheeling (sewage) | 1,125,200 |
| **Wisconsin** | |
| Independence (water) | 94,000 |
| La Farga (sewage & water) | 114,000 |
| La Farga (sewage) | 80,000 |
| Prairie du Chein (water) | 132,624 |
| Taylor (sewage) | 56,000 |
| **Wyoming** | |
| Evanston (water) | 550,000 |
| Rock Springs (sewage) | 333,000 |

## Safe Lighting Under Water



Every once in a while it is found necessary by most of us to do some searching or some work under water. When searching, for instance, the usual method is to "feel" for the object and then retrieve it as best we can. We try to "see bottom," or the object itself by means of a flash or other light, but we usually fail. We don't dare use a pilot light because of the possibility of an electric "short." Ordinary pilot lights are unsafe under water, so don't try to use one.

It is possible, though, to make a pilot light that will be safe. Use rubber-covered wire or cable and be sure that water cannot get through anywhere. Seal the joints with good non-conducting plastic material, which is not at all difficult of accomplishment. There is no "trick" about it—simply keep all wiring and all contact points dry and insulated everywhere. Searching and working under water will then be very much simplified.

Contributed by W. F. Schaphorst, M. E., Newark, N. J.

## Bill Littlehales Dies

### Dean of N. Dak. Water & Sewage Conference

Bill Littlehales, grand old man of the North Dakota Water and Sewage Works Conference, and Superintendent of Water Works and Fire Chief of Dickinson, N. D., passed away recently.

Born in Oquawka, Ill., in 1859, Bill Littlehales became a licensed engineer in St. Louis. For 35 years prior to his recent retirement, he was Water Works Superintendent for the city of Dickinson, and for almost 67 years he had belonged to some fire department. At the time of his death he was probably the oldest active fire chief in the United States. He had long been an outstanding figure.

# VIRGINIA ORGANIZES INDUSTRIAL WASTE AND SEWAGE WORKS ASS'N

## Becomes 30th Member Association in Sewage Works Federation

ON MARCH 4, 1947, at Hotel Roanoke, Roanoke, Va., a one day meeting was held for the purpose of organizing a state association of those having an interest in industrial wastes and sewage disposal. In response to invitations issued by D. R. ("Doc") Taylor, former Supt. of the Roanoke Water Works and now Asst. City Manager of Roanoke, approximately seventy-five persons registered for the meeting, which got underway with "Doc" Taylor serving as temporary chairman.

**President**
*R. W. Digges*
*Manager*
*Hampton Roads San. Distr. Comm.*
*Norfolk, Va.*

**Vice President**
*B. L. Strother*
*Supt. Water Purif.*
*Du Pont Rayon*
*Richmond, Va.*

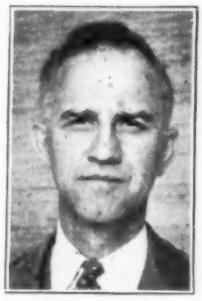
Thirty-nine of the group signified a desire to become charter members of the proposed association. Following the opening remarks by Chairman Taylor, which related the need for such an organization in Virginia, and telling of the status of many polluted streams in the State, the proposed Constitution and By-laws were taken up section by section for analysis and discussion, of which there was considerable. A vote on the Constitution was intentionally postponed until after luncheon, representing a commendable method of permitting "in the corner" discussion by the charter members before putting the Constitution up for adoption by vote. The industrial waste group, looking to their interests, suggested certain alterations which were acceptable and were made.

The name selected for the association was **"The Virginia Industrial Wastes and Sewage Works Association"**—the name proposed by Richard Messer, Chief Engineer of the Va. State Dept. of Health, when about a year ago he proposed the formation of the allied interest association and solicited the assistance of "Doc" Taylor as host and promoter in arranging for the organization meeting in Roanoke.

The most interesting and novel paragraph in the Constitution is found under the heading "Objectives," which reads as follows:

"The objectives of this Association shall be: (1) The advancement of fundamental and practical knowledge concerning the nature, collection, treatment, recovery, utilization, and disposal of sewage and industrial wastes, and the design, construction, operation and management of works for these purposes."

[We have underlined the words "recovery" and "utilization," which were inserted on suggestion of those specifically interested in industrial waste.—Ed.]



**Nat'l. Director**
*L. L. Hedgepeth*
*Exec. Secy.*
*State Water Control Board*
*Richmond, Va.*

**Secy.-Treas.**
*A. H. Paessler*
*Chem. Engr.*
*State Water Control Board*
*Richmond, Va.*

### *President Friel on The State of the Federation*

**Francis S. Friel,** President of the Federation of Sewage Works Associations, came down from Philadelphia to welcome the youngest member of the Federation with the combination interest of advancing curtailment of industrial pollution and sewage treatment as its principal objective.

President Friel in speaking of "The Growing Federation," related the increase of member associations at the rate of almost one per year

**Officers, "Main Springs," Speakers**

*(Front Row)*

*W. Martin Johnson*
*Wiley & Wilson*
*Cons. Engrs.*
*Lynchburg, Va.*

*Richard Messer*
*Chief Engr.*
*State Dept. of Health*
*Richmond, Va.*

*D. R. Taylor*
*Asst. City Mgr.*
*Roanoke, Va.*
*(Chairman)*

*R. W. Digges*
*Manager*
*Hamp. Rds. San. Com.*
*Norfolk, Va.*

*(Rear Row)*

*W. Homer Wisely*
*Exec. Secy.*
*Sew. Wks. Federation*
*Champaign, Ill.*

*Francis S. Friel*
*President*
*Sew. Wks. Federation*
*Philadelphia*

*Linn H. Enslow*
*Editor*
*"Water & Sew. Wks."*
*New York*

*Stephen Meem*
*Town Mgr.*
*Bedford, Va.*

*D. K. MacKenzie*
*Chief Engr.*
*Hampton Roads Sanitary Comm.*
*Norfolk, Va.*

*H. R. Knight*
*Town Engr.*
*and*
*Supt. Pub. Wks.*
*Marion, Va.*

*Jas. M. Dunlap*
*Town Mgr.*
*Lexington, Va.*

*Wm. C. Nelson*
*Wastes Chemist*
*Du Pont Rayon*
*Richmond*

over the past six years and the 32 per cent gain in membership during the same period. He told of three more associations in the process of organization, and of the financial growth of the Federation evidenced by the 1,000 per cent increase in its net worth during the past few years. He reviewed the important committee activities in the Federation, in particular that of the Sewage Works Practice Committee, which had already produced the "Safety Manual" and the "Manual on the Utilization of Sewage Sludge," distributed to all Federation members without charge. He told of progress being made on the development of manuals on "Sewage Chlorination," "Trickling Filters," "Air Diffusion," "Sewer Ordinances," "Sewage Works Accounting," "Paints and Coatings," "Sanitary Districts," and others, all of which in due time members of the Federation will receive without charge.

Mr. Friel commented on the good work of the Committee on Research and the Committee on Standard Methods of Analysis. One of the newest committees is that on Industrial Wastes, a topic which has been receiving more space on Federation programs in recent years and more attention by the Federation's Board of Control, as well as by Member Associations. In the latter direction, he was impressed with the name and the constitutional objectives of the Virginia Association.

### *Secy. Wisely on Aims and Objectives*

W. Homer Wisely, Exec. Secy. of the Sewage Works Federation, traveled from headquarters in Champaign, Ill., to welcome the 30th Member Association of the Federation and to discuss some of the "Aims and Objectives of the Federation," plus "A Suggested Program for a Sewage Works Association."

Mr. Wisely suggested that individual associations develop a "News Letter" for periodically mailing out to members, if not also prospective members. He had found that this method of interim contact with members between meetings possesses considerable value in keeping up the interest of the members and interesting prospective members. He cited the Florida Association's "News Letter" as an outstanding example amongst others.

Every association, said Mr. Wisely, should have its own Committee on Research and Development, which should give especial consideration to methods and processes applicable to problems most specific to the section served by the association—perhaps some particular trade waste problem or design most suitable to the geographical area served. Florida's problems are, for example, entirely different from those of the North and could better be studied by a sectional committee than by a national committee without adequate knowledge of sectional conditions.

**Mayors**

*R. T. Edwards*
*Mayor*
*Roanoke, Va.*
*(Our 35-yr.-old host is making good in Roanoke)*

*J. Q. Peeples*
*Mayor*
*Saltville, Va.*
*(Present in dual capacity, also representing Mathieson Alkali Wks.)*

Concerning a program of "Operator Training," there could be no higher objective. He cited as outstanding the program conducted by the Texas Association. In Texas, he said, the recent 29th Short Course for Water and Sewage Works Operators had a registration of 430. The association has just recently issued its own Sewage Works Operator's Manual, a book of 365 pages. Mr. Wisely also cited the Pennsylvania Operator's Laboratory Manual and a volume of lectures given during a training course sponsored by the Penna. Sewage Works Assn.

As to technical programs, Mr. Wisely advocated the use of the Open Forum type of discussion in which the greatest number of operators can participate, present their problems, etc. He also advocated a program of "Operator Certification" and again referred to Texas as having developed a valuable procedure of such Operator Certification on the voluntary basis, requiring the completion of certain Operator Training Courses held annually.

The several Associations could also take up the matter of "Evaluation of Proprietary Processes and Equipment" being offered in the area served by the Association. In this direction Mr. Wisely cited a report on a certain sewage treatment process offered in the Pacific Northwest, which was released by the Pacific N. W. Assn. This report was issued to inform members and prospective purchasers of the unproven claims for the process and the apparent exaggeration of what the process would accomplish. The report was produced by a special committee of the Pacific N. W. Section. Mr. Wisely also cited a case in the Dakota's involving the issuance of a warning against a certain firm of "Imhoff Tank Specialists" offering their services to municipalities.

*E. L. Thacker*
*Field Consultant*
*Va. Municipal League*
*Richmond, Va.*
*and*
*W. T. Wells*
*City Manager*
*Radford, Va.*

*Wm. P. Hunter*
*City Manager*
*Roanoke, Va.*
*and*
*John L. Wentworth*
*City Engineer*
*Roanoke, Va.*

*W. Frank Chapman*
*Town Manager*
*Salem, Va.*
*and*
*Edw. H. Ruehl*
*Stuart Royer & Assoc.*
*Cons. Engrs.*
*Richmond, Va.*

*F. O. Biehn*
*Stuart Royer*
*Engrs.*
*Richmond, Va.*

*Kyle L. Bruce*
*Supt.*
*Sanitary Bd.*
*Bluefield, W. Va.*

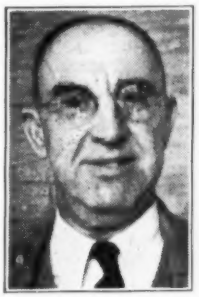
*Stuart Royer*
*Cons. Engr.*
*Richmond*

*E. B. Showell*
*Water & Waste*
*Consultant*
*Du Pont*
*Wilmington Del.*

*Martin Johnson*
*Wiley & Wilson*
*Engineers*
*Lynchburg, Va.*

## *Enslow on Successful Meetings And Effective Publicity*

**Linn H. Enslow,** Editor of *Water and Sewage Works,* and chairman of the Federation's Publicity Committee, being asked if he had anything he would like to add to the thoughts expressed by Messrs. Friel and Wisely, stated that he would like to offer the suggestion that a good publicity program should be developed within the Association. According to his observation, the better the technical program prepared for meetings of an Association, the better the attendance and the more effective the membership growth, and ability to hold members. He wished to amplify Mr. Wisely's suggestion that every meeting have at least one well planned informal discussion period devoted to operators' problems and led by a member able to draw discussion from the floor by calling on members by name to give their experiences and suggestions. The "Question and Answer" or "Information Please" idea, conducted by a panel of so-called "experts," had proved highly successful when properly planned. Written unsigned questions had been the most effective method of getting questions before the "experts," since the question asker will not be afraid that he might expose himself to possible ridicule for not knowing the answer to his questions. Mr. Enslow cited as especially effective the Canadian scheme of holding what they term "Guided Discussions" in which topics for these discussions are listed on colored mimeographed sheets which are mailed out with the regular printed program. The members are requested to come prepared to take part in discussion of those topics on which they are qualified. Leaders are chosen to introduce the topics and only these leaders are given advance notice that they will be called upon to lead off in the discussion of the topic assigned. Much of the success of such "Guided Discussions" depends upon the chairman selected to bring out discussion and guide it so as to secure the most information possible in the allotted time. The same thing can be said for the "Information Please" type of program; the chairman holds the key to its success and should be able to direct the questions to the best qualified of the "experts" and in many instances to someone in the audience who is even more experienced than any of the so-called "experts" serving on the panel. There should be no hesitancy about renaming as chairman for such discussions some man who has demonstrated his adeptness at conducting such guided discussions or question and answer programs. The job might be rotated between two or three members best qualified.



*D. R. Taylor*
*Asst.*
*City Manager*
*Roanoke, Va.*
*(Organization*
*Chairman)*

*Richard Messer*
*Chief Engr.*
*State Dept. Hlth.*
*Richmond, Va.*
*(Originator and*
*Expeditor)*

Concerning "Publicity," Mr. Enslow said that after developing a good, well diversified program as the first requisite, the Association should plug the program, with its Operator Problem Session, through publicity consisting even of postal card reminders of the meeting, the outstanding topics on the program, the principal speakers, the panel of experts, etc., etc., and then a brief comment on entertainment features, bring the ladies, etc.

Mr. Enslow remarked that neither publicizing or ballyhooing meetings or a good technical program taken alone would do the job of building attendance, but the combination had always clicked in his experience, and the keystone appeared to be the quality of technical program—i.e., the first requirement in successful selling of anything is that of first having a quality product to sell.

Concerning "Entertainment," Mr. Enslow commented most favorably on the so-called "Club Room" entertainment which had been so successfully adopted for a number of years by the Canadian Water and Sewage Works groups and tried within the past two years by a number of associations in the States. Through the "Club Room" scheme of entertainment the undesirable features of entertainment in manufacturers' representative's rooms are eliminated. The "Club Room" under joint management of manufacturers and active members, being in operation only during periods when there are no technical sessions or other scheduled functions under way and no private room entertainment permitted, the result has been a noticeably improved attendance at the technical sessions, which results in more effective discussions and interest in the primary objectives of these technical associations. The "Club Room" constitutes the most equitable and democratic method of entertainment, financed through equal assessment on manufacturers' representatives in attendance, but operated under supervision of a joint committee of manufacturers' representatives and active members. It must be understood that the first requirement to the success of the "Club Room" scheme has proved to be the personnel of the

*P. H. McGauhey*
*Prof. San. Eng.*
*Va. Poly. Inst.*
*Blacksburg, Va.*

*Frank H. Miller*
*Distr. Engr.*
*St. Dept. Hlth.*
*Norfolk, Va.*

*E. T. Roetman*
*Chf. San. Engr.*
*Viscose Corp.*
*Philadelphia*

*J. C. Hanes*
*Wiley & Wilson*
*Engineers*
*Lynchburg, Va.*

*C. A. Johnston*
*Supt.*
*Water & Swge.*
*Salem, Va.*

joint Club Room Committee. Where the committee has given the Club Room the thought, the planning and the supervision and management which is so essential to its real success, the opinions of all concerned is that the scheme constitutes an ideal method of providing entertainment. On this score Mr. Enslow said that he desired to enthusiastically endorse the "Club Room" principle of entertainment as democratic, sober, equitable and generally in the interest of the well being of our sectional technical associations.

### *Mayor of Roanoke and Editor of "Roanoke News" In Attendance*

At the luncheon Chairman Taylor introduced the youngest mayor that Roanoke has ever elected—World War Veteran Richard T. Edwards, a young 35 year old attorney who is making a record for himself. Also attending was Carl M. Andrews, editor of the *Roanoke World News*, whose paper was most generous in publicizing the organization meeting of V. I. S. A., both before and during the meeting. Mr. Andrews said that both Roanoke and his newspaper stood squarely behind the movement to clean up Virginia's streams and behind the new Virginia Stream Pollution Law which has been drawn up so as to be equitable and non-crippling to industry and municipalities.

### *Messer on Progress in Sewage Treatment in Virginia*

**Major Richard Messer**, Director of the Div. of Sanitary Engineering, Va. State Dept. of Health, briefly reviewed the progress of sewage treatment in Virginia, which began in 1909 with the construction of a complete treatment plant by Winchester, Va. Today there are 114 treatment plants in the State which serve a population of 807,000 and represents 60 per cent of Virginia's sewered urban population. Also at this juncture 10 more plants are in the planning stage. When completed, 70 per cent of Virginia's urban population will have sewage treatment and the remaining 30 per cent should not be overly difficult to obtain in the present program of securing relief from industrial pollution along with domestic pollution.

The Major exhibited and distributed copies of an outline map showing the locations of the 114 existing treatment plants, the population served and type of treatment given by each. The latest development had been the provision of treatment in the Hampton Roads area, which added a population of 500,000 provided with sewage treatment.

### *Digges on Pollution And Abatement*

The only technical paper scheduled for the organization meeting was that given by **R. W. Digges,** Gen. Mgr., Hampton Roads Sanitation District Commission, who was thereafter elected first President of the Virginia Association in recognition of the vast correction of pollution by 11 communities of the Hampton Roads Area, representing a population of half a million.

After some pertinent remarks about first class municipalities which could not much longer afford *not* to provide treatment of their wastes if they wished to be considered as decent communities, Mr. Digges related how the Hampton Roads Sanitation Districts (11 of them) had been organized and financed through the establishment of the Commission. He told of financing through issue of revenue type bonds of which $6,500,000 had been sold at a rate of interest averaging only 2.02 per cent, which is a rate comparing with that of best municipal bonds. This low interest rate he assumed to be due to the fact that the Revenue Bond Act insures sewer rent collections because if rent is not paid the act permits shut off of water until the delinquent bill is paid. The collections will be made by the water utility serving the communities. Sewer service charges, said Mr. Digges, is construed as inherently no different than payment for water supply which becomes sewage in passing through the facilities of the user.

Mr. Digges pointed out the marked economy in construction and operation of sewage treatment facilities when handled in a joint enterprise such as that of the Hampton Roads Commission. As an illustration he gave the experience of South Norfolk, which voted at first to go it alone in providing sewage treatment. Investigation proved that this going it alone program would cost $20.00 per year per home served, whereas the Commission guaranteed a cost of not more than $6 per year for each home served. Result, a 10 to 1 vote to go it alone changed by the time of the second election to a 20 to 1 vote to accept the Commission's proposal.

### *Hedgepeth Explains New Pollution Control Law*

Following Mr. Digges' paper, **L. L. Hedgepeth,** Exec. Secy., State Water Control Board, was requested to explain the new Va. Pollution Control Act. This he did briefly by saying that the act was primarily a "license" to do some selling of pollution abatement to industry, and the prevention of new or increased pollution. He explained that pollution already existing prior to the passage of the new act could be continued under permits (certificates) with the expectancy that efforts are to be made to reduce pollution as rapidly as permissible. The permits to pollute are subject to modification or revocation whenever circumstances justify such withdrawals.

### *Martin Johnson on Water and Sewerage Improvements in Mexico*

At the close of the meeting **W. Martin Johnson** of Wiley & Wilson, Engrs., Lynchburg, Va., who served as Chief Sanitary Engineer for the Office of Inter-American Affairs in Mexico during and since the war, presented a highly interesting illustrated account of water supply and sewage disposal conditions found in Mexico and the work of providing many new water supplies and sewerage facilities as well as improvements made to existing facilities. Along with the technical phases, Mr. Johnson took us on an illustrated side tour to points of greatest interest in Mexico, including the well known bull fights, all portrayed with vividly colored lantern slides and a running account by Martin Johnson, whose name brings to mind that of a famed explorer and big game hunter in other tropical countries.

### *Officers Elected*

Late in the afternoon the following were chosen officers of V.I.S.A.:

*President*—R. W. Digges, Manager, Hampton Roads Sanitation Comm.

*Vice-President*—B. L. Strother, Supt., Water Purif., Du Pont-Rayon, Amphill Plant.

*Secy.-Treas.*—A. H. Paessler, Chem. Engr., Va. State Water Control Board.

*Natl. Director**—L. L. Hedgepeth, Exec. Secy., Va. State Water Control Board.

*Member of Board of Control, Sewage Works Federation, for 3-year term.

# STABILIZATION IN SEWER CONSTRUCTION

## Some Notes Pertaining to Stabilization and Jointing of Gravity Pipe Lines in General

By M. W. LOVING
Consulting Engineer
and
Concrete Technologist
CHICAGO, ILL.

The Author

GRAVITY pipe lines constructed through yielding soils as sewers, drains and culverts, must be stabilized within practical limits, to minimize settlement, uplift or lateral displacement. Rigid or flexible joints made with any kind of material or compound will not remain tight if the pipe lines are disturbed by movement of the soil mass through which they are constructed.

When the elevation of the water table is above invert gradient, infiltration of ground water into defective joints of pipe lines increases sewage treatment and pumping costs and endangers the structural stability of all pipe lines constructed through muck, quicksand and the like. Expensive maintenance and eventual replacement is inevitable in these cases. The hydraulic capacity of gravity pipe lines is reduced in direct proportion to the settlement because sumps promptly fill with suspended matter and these sections of pipe line must be reconstructed to establish gradient before normal hydraulic efficiency is restored.

The primary reasons why all pipe lines should be stabilized is to avoid dynamic loads which are so devastating and cause distortion and breakage of pipe lines in certain kinds and combinations of soils.

Pipe of all kinds are manufactured and sold today under standard specifications and are guaranteed, by responsible manufacturers, to meet and exceed the design and test provisions of the specifications. When pipe of proven quality is delivered to the site of the work and accepted by the engineer, representing the owner, the legal responsibility of the manufacturer ends, because he has no control over the use of his product, but responsible manufacturers are interested in and concerned with the proper installation and use of their products. When and if failures occur or faulty construction results in expensive maintenance, responsible manufacturers are often blamed for something that is beyond their control because once pipe lines are backfilled, it is very difficult to prove who is responsible. Unfortunately the owner, the public, has to bear expensive maintenance costs due to faulty workmanship and/or poor engineering supervision in constructing pipe lines.

### *Competent Construction Supervision the First Requirement*

Contractors build pipe lines under the supervision of the engineer or his authorized representative. Competent inspectors should be required to see that the work is done right and the engineer should provide simple but rigid controls for field work with clear-cut directions, illustrated with drawings and pictures, so that the contractor's workmen will understand each operation and why it is so necessary to do the work right. Careless workmanship is more often the result of inadequate instruction than intent on the part of the contractor or his workmen. Experienced engineers say that contractors charge no more for high-class workmanship because they realize that fair but rigid inspection is in the public interest and costly litigation due to faulty workmanship seldom results when work is done right at the outset.

To illustrate how pipe lines are stabilized when constructed through unstable soils we are presenting herein a brief, illustrated description of work on large projects in Jacksonville, Florida; World War II projects in the San Francisco Bay area of California; the Sewerage and Water Board, New Orleans, Louisiana; cities of northern Indiana, including Gary and Hammond; the great Idlewild Airport, City of New York; the State Highway Department and Effingham County, Georgia and Bexar County, Texas.

### *Start With the Foundation*

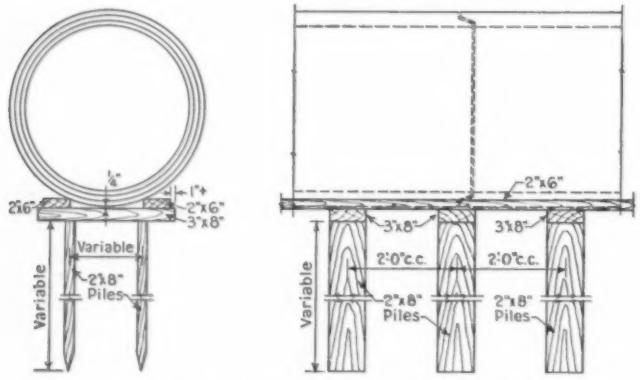
Foundations for pipe lines must be firm but slightly yielding; this condition is naturally obtained when they are constructed through sand, gravel and other granular soils. If joints are made tight and remain tight the structural stability of the pipe lines is assured when the water table is above or below invert gradient. If joints are *not* made tight and do not remain tight, when the water table is above invert gradient, sand and other finely divided soil is transported in suspension by ground water into the pipe lines through defective joints and thence to the outlets of the lines. Caverns are formed in the soil mass around and over the defective joints. Eventually the soil mass settles into the caverns and expensive maintenance or replacement of pipe lines, at many times the initial cost, is inevitable.

Gravity pipe lines are constructed on grades to provide self-cleansing velocities of two or more feet per second when the pipe lines flow full or half-full. When and if velocities are high the soil mass surrounding the pipe is sucked through the defective joints and the formation of caverns in the soil mass is accelerated. This leads to eventual destruction of pipe lines, because devastating, dynamic loads are built up by such movement of the soil mass.

Dr. Ogden has stated*, "The proper design of a foundation, and a reasonable adjustment of the character of the foundation to the necessities of the particular case in hand, call for the best judgment of the engineer, and

* "Sewer Construction" by Henry N. Ogden, Professor of Sanitary Engineering, Cornell University, published by John Wiley and Sons, New York.

should be based on experience and observation. Elaborate foundations in soils which may not require them may indicate the anxious conservatism of the constructing engineer, but they are extravagantly expensive, and may expose the ignorance of the engineer quite as much as a failure of a sewer due to insufficient foundation.




**Dwarf, or Saddle Piling for Stabilizing Pipe Lines**
*(Drawings, courtesy W. E. Sheddan, City Engr., Jacksonville, Fla.)*

A municipality before entering into any extensive foundation work for sewer construction can well afford to secure advice from engineers experienced in such work, rather than follow the designs of a local engineer whose training has not given him the special knowledge obtained in wider practice. . . ."

"As a last resort, when the earth seems to have little or no sustaining power, or is so variable as to indicate that the vertical alignment of the sewer would be quite destroyed, is to drive piles and thus support the sewers. Colonel Waring invented and made use of so-called saddle piles, which were 2-inch plank 10 to 12 inches wide sharpened at the lower end and so driven in the bottom of the trench that the pipe would rest in notches cut in the upper end, a pile coming just behind the bell of each pipe."

### *Dwarf or Saddle Piling*

Dwarf or saddle piling has been extensively used at Tampa and Jacksonville, Florida, and the following is quoted from a letter from W. E. Sheddan, City Engineer of Jacksonville, Florida, who supplied the accompanying drawings of saddle piling.

"I am sending you herewith several detail plans showing different standard types of construction used in the City of Jacksonville, also a plan of the wedge for holding sewer pipe in place on bottom boards.

"The 2" x 8" dwarf pile used vary in length, depending on soil conditions, anywhere from 18" to 3 or 4 feet as a rule, although there have been places where we have driven them as much as 8 to 10 ft. in depth.

"I am quoting paragraphs from our specifications:

'Excavation shall be in open trenches adequately shored and sheeted, and wide enough to allow workmen ample space to work in. Trenches shall not be opened more than 12 hours in advance of pipe laying. If for any reason pipe laying is delayed, the trench shall be refilled, if in the opinion of the Engineer it becomes necessary, and shall not be opened again until pipe laying is resumed. If trenching machine, dragline or other mechanical means are used, the cutting edge shall not come nearer than 3 inches to the grade. If for any reason excavation is carried below grade, suitable material, acceptable to the Engineer, shall be thoroughly tamped in place until a firm, unyielding foundation is obtained, true to line and grade.'

'If a firm foundation cannot be obtained, the pipe shall be laid true to line and grade on the type of foundation called for in the proposal or noted on the plans or as otherwise designated by the Engineer.'

'If timber piles are required, they shall meet the requirements for "Timber Piles" specified elsewhere in these specifications, and of the lengths and spaced and driven as called for on the plans or as required by the Engineer. Dwarf or saddle piles shall be driven by an approved air hammer, or by a heavy wooden maul to the depth and bearing required by the Engineer.'"

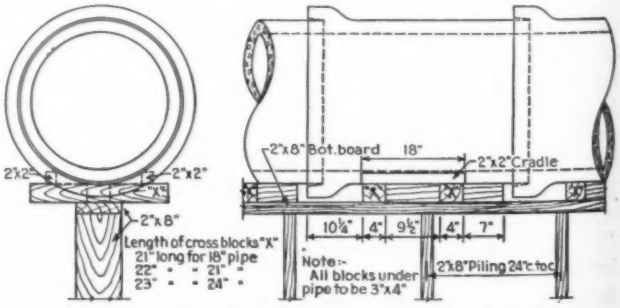
## PIPE LINE JOINTING

Joints of pipe lines are just as good as you make them, and a pipe line is only as tight as its weakest joint. This is true regardless of the kind or length of pipe and the material used to make joints. Too often joints are not carefully made, especially under the lower half of the pipe line—visible only to the workmen who make the joints and it is a difficult task for the engineer or his inspector to check each joint of a pipe line, especially when they are constructed in deep trenches in unstable soils. Thus when leaks develop or excessive infiltration occurs, it will usually be found on investigation that the joining material or compound is conspicuous by its absence.

Experienced engineers find it expedient to specify maximum infiltration requirements and actual tests on finished lines after the ground water has risen to its normal level.

### *Mortar Joints*

Cement mortar has been specified by experienced engineers for more than fifty years to seal joints of concrete and clay pipe sewers and drains, cast iron pipe water lines operating under high heads and cast iron pipe gas mains operating under low pressures. When and if cement mortar joints are carefully made and properly cured, they are absolutely water tight, otherwise they could not be so extensively used for cast iron pipe water and gas mains. In a number of cities of this




**Another Form of Saddle Piling Used in Jacksonville**
*(Similar construction is employed at Tampa, Fla.)*

country and Canada cement mortar joints are specified exclusively for making joints in cast iron pipe gas and water mains.

The exclusive use of cement mortar for making joints for concrete irrigation pipe lines in California and elsewhere is the most conclusive proof we have of its excellent performance. Concrete irrigation pipe lines operate under heads ranging from 12 to 60 ft. and are guaranteed by the pipe manufacturers, who usually supervise installation of irrigation pipe lines, against

leakage for one year. Joints are made and properly cured by workmen who are skilled in the art. If joints leak they must be repaired by and at the expense of the manufacturer. There are more than 30,000 miles of concrete irrigation pipe lines in California alone. Some have been in service up to sixty years and are in excellent condition today. Cement mortar joints are rigid and are as strong and tight as the barrel of the pipe.

### *Bituminous Compounds*

Bituminous joining compounds for making joints of concrete, asbestos-cement, and clay pipe sewers, drains and culverts, have been specified by many experienced engineers. Where pipe lines are likely to be disturbed due to slight settlement, the flexible joint will remain tight so long as movement is confined within reasonable limits. Some of the commercial bituminous compounds have given good service and others have caused serious trouble, because their life expectancy is limited. Moreover, a number of serious structural failures of pipe lines have been caused when inferior quality bituminous compounds have been used. The provisions in the specifications for drains of Idlewild Airport, (N. Y. City) quoted below, are the best we have seen:

"Jointing Compound material shall consist of a non-volatile bituminous binder, a suitable solvent and a suitable inorganic filler. It shall be smooth and uniform, shall show no separation upon standing after mixing and when set, shall be sufficiently elastic to permit of a slight movement of the pipes without injury to the joints or breaking the adhesion of the compound to the pipes. The compound shall not deteriorate when submerged in fresh or salt water or normal domestic sewage. It shall show no deterioration of any kind when immersed for a period of five days in a one per cent solution of hydrochloric acid or a five per cent solution of caustic soda. The compound shall be workable with a trowel and of putty-like consistency. It shall conform to the following requirements.

| Non-Volatile Matter | Min. | Max. |
|---|---|---|
| 10 grams, 24 hrs. A | 70.0% | |
| 221°-230°F. | 15.0 | 45.0 |

**New Orleans Method of Jointing**

*Oakum is caulked into the space between the spigot and bell and sealed with hot poured bituminous compound, using a joint runner.*

**36 in. Pipe With Rubber Gaskets in Place**

*The firmed gaskets are held on the tongue of the pipe with rubber cement.*

| Inorganic Filler | |
|---|---|
| **Behavior @ 140°F.—5 hrs.** | |
| Prepared on Steel | ¼" Sag Maximum |
| Prepared on Concrete | ¼" Sag Maximum |
| **Behavior @ 32°F.** | |
| After 1 hr. exposure to temperatures of 32°F., the metal test pieces shall be bent slowly over a mandrel 1½" in diameter. | Shall show no cracking of the plastic, and no separation of the metal and plastic. |

"The jointing compound the Contractor proposes to use shall meet the approval of the Engineer. Such approval will not bar subsequent rejection if the joints prove unsatisfactory for use under field conditions."

### *Rubber Gaskets*

Rubber gaskets as used for sealing joints of reinforced concrete pipe lines at Gary, Indiana in 1938 and Hammond, Indiana in 1946, when backed up with cement mortar, undoubtedly comprise the most advanced and best joint assembly that has been developed to date to provide for slight movement and at the same time, remain tight when the line is subject to slight movement. While other kinds of joint compounds were permitted in the specifications all the contractors bidding on these projects planned to use rubber gaskets, backed up with cement mortar because of the rigid requirement in respect to permissible infiltration and the enforcement under actual tests. It will be seen that the elevation of the water table in these northern Indiana cities ranges from 5 to 20 ft. above invert gradient and unless the joints were made tight the infiltration limits could not be met. Moreover, the joints of the pipe had to be truly concentric so that the rubber gasket was uniformly compressed around the periphery of the joint. Experienced rubber technologists say that rubber gaskets must be so shaped that when placed in pipe joints the rubber must be compressed and not subject to tensile stresses. Rubber gaskets have been used successfully for sealing joints of cast iron gas and water mains for more than 50 years, in this and many foreign countries and will be extensively used for joints in pipe lines of all kinds on an ever-increasing scale.

## ECONOMICAL CRUSHED STONE FOUNDATIONS

Crushed stone mats were employed before and during World War II to stabilize pipe lines in very unstable soils for drains, sewers and water lines for the Naval Air Station, Alameda, California, the Naval Depot, Oakland, the Army Port of Embarkation, Oakland, Kaiser Ship Yards, Richmond, and a number of housing projects in the San Francisco Bay area. The sites for the Navy projects were constructed by pumping sand from San Francisco Bay onto tidal marshes; each area was confined within dykes. The fills for the Army and the Kaiser ship yards projects were made by hauling in fill material. Because of the slimy unstable marshes on which these fills were made, the pipe lines were not constructed until after the fills had consolidated. But when trenches were opened it was necessary to stabilize pipe lines on or in the marsh mats.

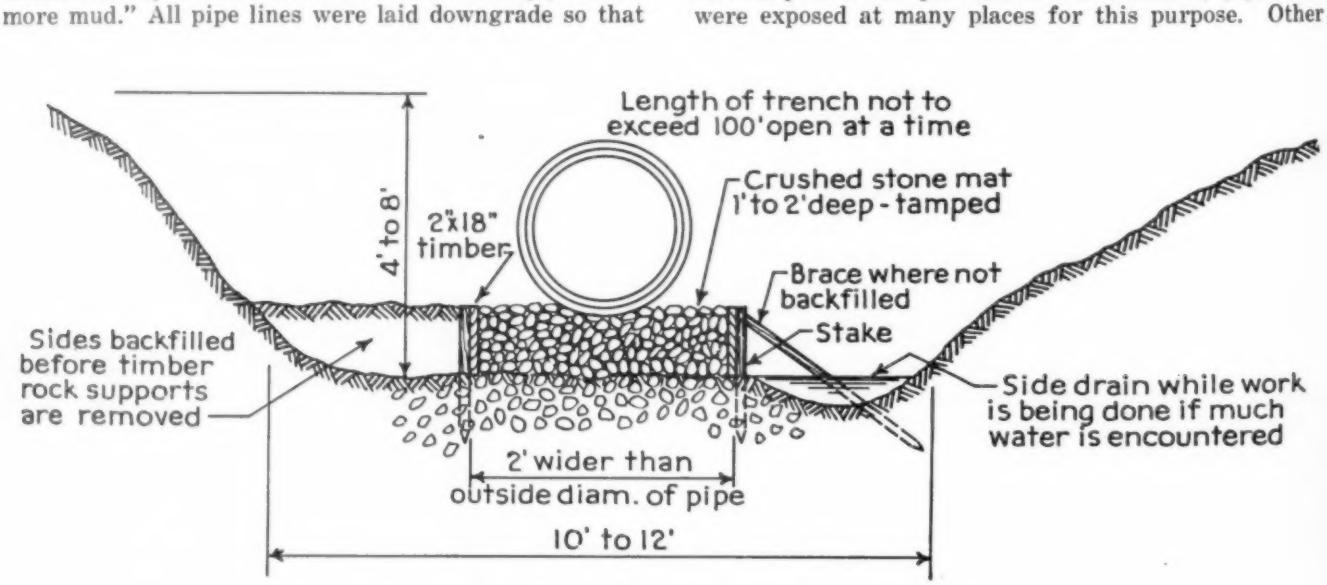
All pipe lines built with concrete sewer pipe in diameters from 6 to 21 in., and reinforced concrete pipe from 24 to 42 in. in diameter, were stabilized on crushed stone mats, as shown in the accompanying drawing. More than 100,000 ft. of pipe were required for the Naval Air Station at Alameda and even greater quantities were used on the Army Port of Embarkation and other projects named. All pipe lines when used on these projects of equivalent size—clay sewer pipe, cast iron pipe for water supply, corrugated metal pipe for drains —were stabilized in a like manner. This proved to be the most efficient and economical method considering the vast number of pipe lines required and the limited time for construction.

It will be seen that two lines of timber were placed on edge and braced on the bottom of the wide trench to receive the crushed stone mats which ranged in depth from 1 to 2 ft., and about 2 ft. wider than the external diameter of the pipe. For the larger pipe lines, 2 x 18 in. timbers were used and 1 x 12 in. for the smaller lines. Under favorable conditions the crushed stone was compacted into the bottom of the trench without the use of timber. The crushed stone mat when compacted with pneumatic tampers, or by using a clamshell bucket, was required to have a supporting strength of about 11,500 lbs. per square ft. Clean crushed stone free of fine material was used; crusher run stone proved unsatisfactory because the fine material simply "made more mud." All pipe lines were laid downgrade so that the water ran forward to sumps from which it was continuously pumped, ahead of the laying operation.

The contractor's equipment consisted of a large crane equipped with an extra long boom and a dragline bucket. The long boom was utilized for casting excavated material a distance from the trench. This was necessary because the slimy marsh mat, from 8 to 12 in. thick, proved to be a lubricant, which with the extra weight of the soil caused the trench sides to slide toward the open trench. A smaller crane with a long boom equipped with a clamshell bucket, was also employed; this was used for placing the crushed stone and laying the pipe in the trench and for the initial back-filling around and over the pipe lines. A large Diesel-powered caterpillar bulldozer and scraper was used for the final backfilling. Pumps were used to de-water the trenches at sumps as previously stated, ahead of the pipe laying operation.

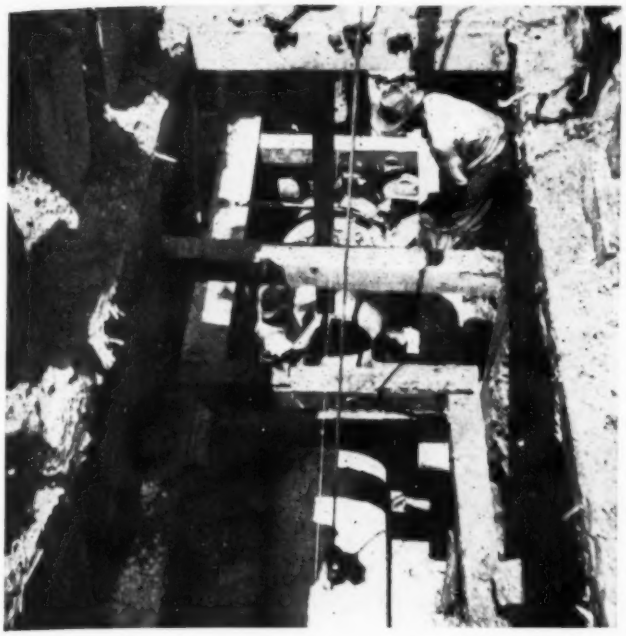
About 100 ft. of the wide trench was opened at one time, the depth ranging from 4 to 8 ft., depending on the size of the pipe line. Width at bottom was from 10 to 12 ft. The water table varied slightly from 1 to 2 ft. below invert gradient. Excavated soil was sometimes piled on both sides of the trench to avoid excessive loads that would cause sloughing of the trench banks. Each pipe was set to established line and grade on the crushed stone mat and checked by an engineer with a transit, also used as a level. Joints were made with bituminous compounds on the assumption that should there be a slight settlement, flexible joints would minimize infiltration. [Rubber gaskets were not available for this work prior to and during the war but for similar construction it is expedient from a sound engineering standpoint to use rubber gaskets to provide a preseal to be backed up with cement mortar of a plastic consistency as described for the sewers at Hammond and Gary, Indiana.] Just as soon as the pipe was installed and the joints made the trenches were backfilled. Approximately 400 ft. of 24 in. pipe line was laid by this method in an eight-hour day.

Check levels, which were run on many of the completed lines, revealed that they were on established grade with little if any settlement. This was accomplished by comparison with established elevations from central points and permanent bench marks; pipe lines were exposed at many places for this purpose. Other


Length of trench not to exceed 100' open at a time
Crushed stone mat 1' to 2' deep - tamped
4' to 8'
2"x18" timber
Brace where not backfilled
Stake
Sides backfilled before timber rock supports are removed
Side drain while work is being done if much water is encountered
2' wider than outside diam. of pipe
10' to 12'

**Example of Stabilization Through Use of Crushed Stone Mat**

*This method of stabilization was effectively employed on the West Coast for rapid sewer construction for Army and Navy projects.*



**New Orleans Sewer Construction and Stabilization**
*For details of method of stabilization see accompanying drawing showing crushed shell bedding.*

checking was done later when laterals from buildings were attached to main intercepters.

When pipe lines are thus stabilized there is no tendency to settle or float because they become an integral part of the compacted soil mass. The soil mass is stable so long as the joints are made tight and remain tight, to prevent infiltration of fine sand, muck, et cetera, into the lines.

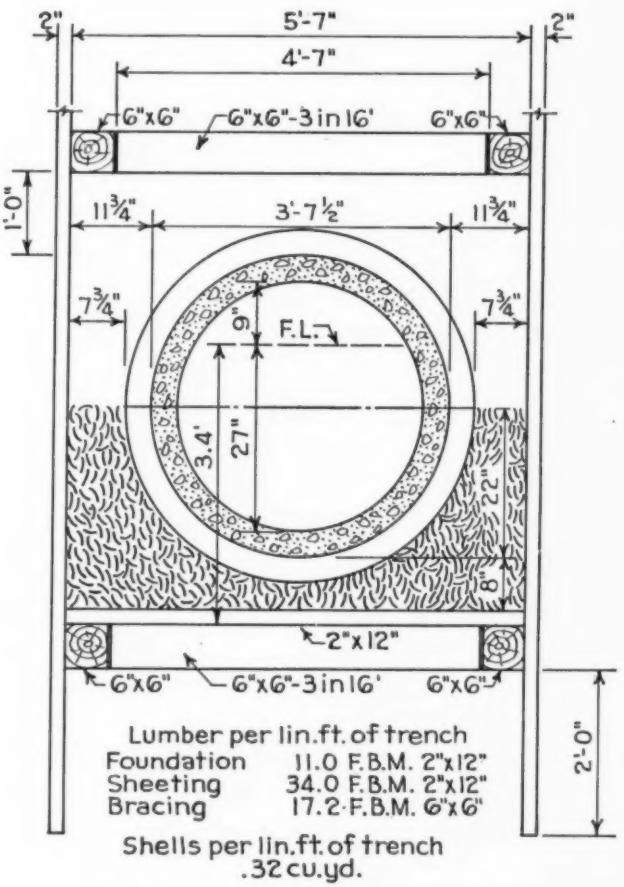
The principal reason why it is so necessary to stabilize the soil mass before pipe lines are constructed within them is illustrated by an experience at the Marine Base, Quantico, Virginia, about ten years ago. A 66 in. reinforced concrete pipe line was stabilized on piles across a tidal marsh. Soon thereafter the area was filled by hydraulic dredges with soupy muck and the empty pipe line floated several feet above its pile support. The empty pipe line weighs 1550 lbs. per ft. but displaced 34 cu. ft. of watery muck per ft.; thus the uplift, less the weight of the pipe line, was 570 lbs. per ft. In stabilizing pipe lines of any kind through unstable soils, it is often difficult to determine whether the pipe line should be stabilized to prevent settlement, when they flow full, or uplift when they are part full or empty. Moreover there have been many cases where pipe lines improperly stabilized have developed leaks at well made joints, due to settling movement within the soil mass when they flow full and later float when half full or empty. This is the principal reason why all pipe lines should be stabilized when constructed through unstable soils.

## NEW ORLEANS' PRACTICES

In New Orleans the construction of pipe lines is extremely difficult and expensive because the soil mass through which they are constructed is very unstable. Timber sheathing, with sea shell embedments, is required to stabilize most pipe lines with depth of cuts to invert, ranging from 8 to 24 ft.—the average cut for all the sewers being about 8 ft.

The accompanying drawing was prepared from a blue print kindly furnished by Alexander Allison, Jr., Designing Engineer, Sewerage and Water Board, New Orleans. The same designs are specified for concrete pipe sewers ranging in diameter from 8 to 15 in., and for reinforced concrete pipe sewers from 15 to 36 in. in diameter. Obviously, the same type of construction is also employed for clay pipe that has been used for building gravity sewers in New Orleans. Foundation concrete embedments can seldom be used to stabilize pipe lines in New Orleans, because the added weight causes the lines to settle and break in the black muck, quicksand and the like, through which most of the pipe lines must be constructed.

Mr. Allison said that sewers now being constructed in New Orleans are in the northern limits of the city and in many places a stratum of sea-bottom sand is located at the levels of the deeper sewers; by utilizing well points to lower the water table during construction so joints can be made tight and inspected, the expensive timber sheathing and sea shell embedments are not necessary to stabilize pipe lines in those areas. Mr. Allison's recommendations in this direction were confirmed by N. M. Redmond, Superintendent of Construction and in Charge of Sewer and Water Pipe Line Maintenance of the Sewerage and Water Board, whom I interviewed. According to the Annual Report of the Sewerage and Water Board, December 31, 1945, 775.93 miles of sewers have been constructed in New Orleans; 20.00 miles have been abandoned, replaced or destroyed and on January 1, 1946, there were 744.93 miles in service. The sewers range in diameter from 6 in. to 84 in.; some are special sections and were constructed with




**New Orleans Method of Stabilization**
*Timber sheathing and embedment of sea-shells to the springline of the pipe is used to stabilize all sewers and drains from 8 to 36 in. in muck, quicksand and the like. Drawing, courtesy Sewerage & Water Board of New Orleans.*

**New Sewer Under Construction—Hammond, Ind.**
*After lowering the water table with well points, the 36 in. concrete pipe with lubricated rubber gasket in place on spigot end is lowered into the trench and guided into the bell of the previously laid length of pipe.*

brick, monolithic concrete—plain and reinforced, cast iron pipe, clay pipe, concrete pipe and reinforced concrete pipe. Thus the methods that have been found necessary to stabilize pipe lines in New Orleans are based on more than fifty years of practical experience.

Joints must be made tight, otherwise infiltration of the soil mass into the pipe lines, through defective joints, will cause unbalanced stresses and eventual failure. Experienced inspectors are detailed to see that each joint is properly made and contractors are not permitted to make joints or lay pipe in the absence of the inspectors.

## RUBBER GASKETS AND INDIANA EXPERIENCE

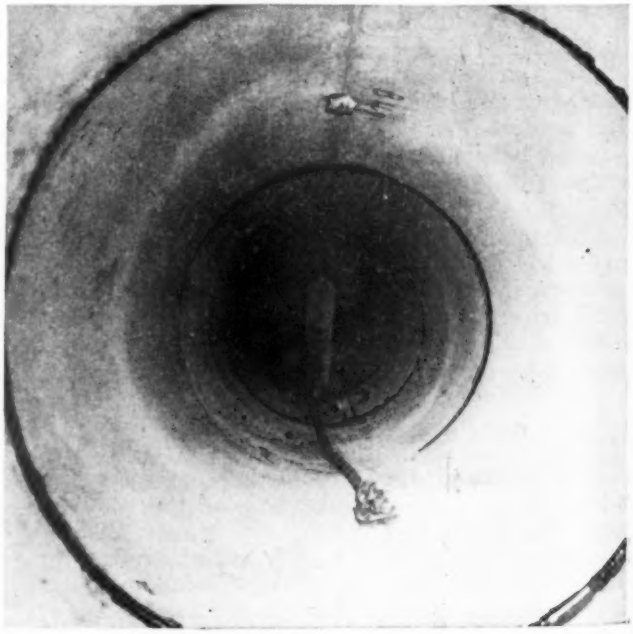
In cities of northern Indiana, Gary, Hammond, Michigan City and South Bend—located in the "sand dune" country, sewers are constructed with cuts to invert from about 12 to 37 ft. Well points have been used since 1922 to lower the water table, which is from 5 to 20 ft. above invert gradient, so that reinforced concrete pipe lines, ranging in diameter from 12 to 108 in., can be constructed. The water table is usually maintained at an elevation of about 2 ft. below invert gradient so that the pipe lines can be laid in a dry trench and the joints carefully made with portland cement mortar and inspected. Because of the comparatively coarse texture of the sand, no expensive foundations or embedments are required for pipe lines and in many cases, sheathing for trenches is not necessary. Most of the pipe lines of larger diameter are laid in V-trenches with no sheathing required. When the water table rises to its normal elevation the sand provides a firm embedment and movement of the pipe lines is minimized. In 1929 the writer carefully examined the internal surface of many reinforced concrete pipe lines that had been installed in the cities mentioned from 1926 to 1928. Joints were tight and grade and alignment were excellent.

An 84 in. reinforced concrete pipe intercepting sewer 10,000 ft. in length, constructed in 1927, in one of the large steel plants in Gary, Indiana, was in excellent condition when examined by the writer on November 13, 1929. This sewer was constructed in sand after the water table had been lowered with well points. The joints were made tight with cement mortar.

In 1938, intercepting and outfall sewers were constructed in Gary requiring 21,000 ft. of reinforced concrete pipe, ranging in diameter from 42 to 84 in. Because the sewers were constructed in sand, with a high water table, well points were required to lower the water table during construction so the pipe lines could be constructed in dry trenches and the joints carefully made and inspected. The sewerage improvement required 3000 ft. of 84 in., 11,000 ft. of 72 in., and 7000 ft. of 42 in. reinforced concrete pipe. The cut to invert ranged from 20 to 35 ft. and the elevation of the water table was about 20 ft. above invert gradient. The engineers, Chas. W. Cole and Sons, South Bend, Indiana, required a maximum infiltration limit of 1000 gal. per in. of diameter per mile in twenty-four hours ("inch gallons"). The reinforced concrete pipe was provided with joints of accurate dimensions, fitted with rubber gaskets and the annular space inside of the pipe at the joints was sealed with cement mortar. Manholes were also constructed with 48 in. reinforced concrete pipe and the joints made the same way.

When final tests were made of the finished pipe lines, after the water table had risen to its normal level, the infiltration was less than 250 inch gallons—i.e. just one fourth the allowable joint leakage.

J. A. Piersol, Consulting Engineer, designed and is supervising construction of a 36 in. reinforced concrete pipe intercepting sewer, 7200 ft. in length, at Hammond, Ind. The cut to invert ranges from 12 to 19 ft. and the elevation of the water table is about 5 to 10 ft. above invert gradient. The following quotation is from the specifications: "The total seepage and infiltration of ground water as determined by test shall in no case exceed five hundred (500) gallons per twenty-four hours per inch of diameter per mile of pipe. An infiltration test or tests shall be made on all sewer construction before placing the same in service and be-



**Interior of 36 in. Sewer—Hammond, Ind.**
*The joints are sealed to a smooth finish with portland cement mortar.*

fore any connections are made to other sewers, and if the quantity of infiltration into the sewer or sewers is in excess of the maximum quantity as specified above, the joints shall be re-caulked or re-made or the sewer relaid if necessary, or other remedial construction shall be performed by and at the expense of the Contractor, in order to reduce the quantity of ground water infiltration to an amount within the limits as specified. In the making of infiltration tests the Contractor shall furnish the required equipment and labor and do the necessary pumping under the direction of the Engineer and tests may be repeated until each sewer individually meets the specifications as to quantity of infiltration as set out above."

Well points are employed to lower the water table so that pipe lines can be laid in a dry trench and the joints carefully made and inspected. At this date, July 1946, Mr. Piersol said that the infiltration, when the water table rises to its normal level, is not expected to exceed 250 inch gallons, or 8000 gallons per mile per day for the 36 in. sewer.*

### *How the Gaskets Are Used*

Rubber gaskets were fitted with rubber cement to the tongue-end of each 5 ft. length of reinforced concrete pipe by the manufacturer—see pictures. The faces of the groove and the tongue of each pipe are truly concentric so they fit, when pulled together, like machined castings, because the joints were cast with base and top rings machined to very accurate dimensions. Extreme care is exercised by the contractor, the Northern Indiana Constructors, in laying the pipe to establish line and grade. The groove end of the joints is swept clean with a whisk broom and the spigot end, fitted with rubber gasket, is drawn on the same gradient into the groove of the first pipe with a pulling device

**Pulling Device**

*Used for forcing the gasketted tongue of the pipe into the socket to a close fit.*

shown in the accompanying pictures. The rubber gasket is compressed uniformly around the periphery of the pipe at the joints so that annular space of about one inch is provided on the outer and inner surfaces of the pipe line. This space is sealed with cement mortar of a plastic consistency.

Mr. Piersol, like other experienced engineers, says that a positive way to control infiltration is to specify maximum infiltration requirements and test the finished lines to enforce compliance. These results at Hammond and Gary in controlling infiltration are outstanding accomplishments on the part of the engineer, contractor and pipe manufacturer. All have to work together to the same end.

* "A reasonably liberal allowance to specify for infiltration in new sewers is 30,000 gallons per mile per day if measured under high ground water conditions and 20,000 gallons per mile per day under low ground water conditions."—Ralph W. Horne, partner Fay, Spofford and Thorndike, Consulting Engineers, Boston, Mass., in *Sewage Works Journal*, March, 1945.

## Swimming Pool Operation

Perhaps not too many water or sewage works superintendents have the problem of supervising swimming pool operation. Some department of health and other sanitary engineers may. But most persons interested in the field of water and sewage treatment will be interested to know that the State of Illinois Health Department under the direction of C. W. Klassen, Chief Sanitary Engineer, has prepared a mimeographed bulletin of 47 pages devoted entirely to the subject of Swimming Pool Operation.

Five chapters make up the bulletin, and the general topics presented include general considerations, bathhouse, water treatment plant, pool area, and miscellaneous information. Among the many topics treated are such items as pool variables, disease and swimming, floor disinfection, foot baths, make-up water and cross connections, chlorination, filtration, algae control, operation reports, and bacteriological analyses, as well as many, many others.

It would appear from an inspection of this bulletin that as a reference work it should appear in the library of every sanitary engineer and water and sewage works superintendent.

## Inter-City Ownership of Water Supply System Interesting

Extremely interesting and possibly pointing toward a future practice is the fact that the cities of Saginaw and Midland, Mich., are joining together to construct and operate a joint water supply system which is to cost the tidy little sum of almost $12,000,000. It developed that such a joining of public interests was legal and will effect considerable economy in the construction and operation of the joint enterprise as contrasted to the costs estimated for two separate systems.

## Milwaukee Appoints E. F. Tanghe to New Position of Ass't Supt. of Water

### A Career Promotion, Backed by 20 Years of Service

On March 21st announcement was made by Herbert H. Brown, water works superintendent at Milwaukee, of the appointment of E. F. Tanghe as assistant superintendent, a position that has been vacant since it was created two years ago. Tanghe, who joined the city engineer's office in 1927, has since 1937 held the position of principal assistant engineer in charge of research and design in the water research division. Before that he was pitometer engineer on City Engineer Schwada's staff, studying the water pressure and surveying the city water distribution system for leakage and water theft.

Assistant Superintendent Tanghe majored in civil engineering at the University of Wisconsin, where he earned his degree in 1914.—J. E. H.

# WATER AND SEWAGE PATENTS

(Of Recent Issue)

## WATER PATENTS

**Method and Apparatus for Treating Water Comprising the Steps of Passing a Variable Flow of Relatively Alkaline Water Upwardly Through a Bed of Organic Hydrogen-Zeolite and Augmenting Said Flow by Hydrogen-Zeolite Treated Water.** John J. Felsecker (to Graver Tank & Mfg. Co., Inc.); U. S. 2,412,328; Dec. 10, 1946 (Appl. 4-13-44). Title describes patent.

**Valve Actuating Mechanism.** Alfred Mueller (to Crane Co., Chicago, Ill.); U. S. 2,412,529; Dec. 10, 1946 (Appl. 5-22-43). An operating mechanism for valve of rotary type frusto-conical closure.

**Fluid Meter.** Nathaniel Brewer (to Fischer & Porter Co., Hatboro, Penna.); U. S. 2,414,086; Jan. 14, 1947 (Appl. 11-25-43).

A system for remote indication of fluid rate-of-flow having a rotameter including a vertical metering tube and float adapted for free up-and-down movement responsive to variations in rate-of-flow through said tube.

**Hydraulic Relief Valve.** Joseph F. Melichar (to The Parker Appliance Co., Cleveland, Ohio); U. S. 2,415,750; Feb. 11, 1947 (Appl. 12-30-43).

**Adjustable Pipe Clamp.** Frederick T. Newell (to Dresser Industries, Inc., Bradford, Penna.) U. S. 2,415,753; Feb. 11, 1947 (Appl. 8-24-44). A pipe clamp for applying sealing pressure to a gasket for a bell and spigot pipe joint, utilizing an anchor ring, a sectional follower ring having a gasket engaging surface, and a rearwardly projecting bracing flange with necessary bolts.

**Anti-Water-Hammer Device.** Aaron Shaff, New York, N. Y.; U. S. 2,416,024; Feb. 18, 1947 (Appl. 9-15-45). A device for eliminating water hammer in systems conducting fluids under pressure, having an air chamber and necessary valves and appurtenances.

**Centrifugal Pump.** John B. Wade (to Food Machinery Corp.) U. S. 2,416,031; Feb. 18, 1947 (Appl. 1-31-42). A vapor eliminating centrifugal pump, with impeller rotating on a vertical axis.

**Purification of Liquids By Subjecting Successively Confined Portions of Said Liquid to Supersonic Vibrations and Simultaneously Bubbling Oxygen Through Said Confined Portions.** Irving Wolff (to Radio Corp. of America); U. S. 2,417,722; Mar. 18, 1947 (Appl. 7-31-42). Method for sterilizing liquids with supersonic vibrations in presence of dispersed bubbles of oxygen.

These patent abstracts being brief do not necessarily cover the entire scope of the invention described. If the reader becomes especially interested in any of these patents he should obtain printed copies of the complete patent, at 25 cents each, from the Commissioner of Patents, Washington 25, D. C.

### *WASTE PURIFICATION APPARATUS*

**Continuous Sterile Water Supply System.** Ernest Rothwell (to Chas. F. Thackeray, Ltd., Leeds, England); U. S. 2,417,950; Mar. 25, 1947 (Appl. 10-31-44). A system of tanks and distribution systems for supplying sterile water but does not include a sterilizing process. The water entering the system must be sterile, and it will be maintained so.

## SEWAGE PATENTS

**Waste Purification Apparatus Having Superposed Aerating and Clarifying Chambers.** Edward B. Mallory, Tenafly, N. J.; U. S. 2,413,838; Jan. 7, 1947 (Appl. 8-2-40). Aerator-clarifier apparatus, including an aerator chamber of substantially annular form with bottom wall sloping downward to a peripheral discharge passageway, a clarifier chamber with lower sludge receiving zone underlying the aerator chamber.

**Process of Drying Peat and Other Aqueous Materials.** Gustav Bojner, Stockholm, Sweden; U. S. 2,413,942; Jan. 7, 1947 (Appl. 4-7-43). An apparatus for continuously drying wet material in several stages.

**Sewage Disposal Device for Toilets.** Hal Weir McPherson, Chicago, Ill.; U. S. 2,414,964; Jan. 28, 1947 (Appl. 9-12-42). A sewage and/or garbage grinding and pumping mechanism located adjacent to the outlet of a water toilet so that discharge of sewage or garbage is to grinder mechanism.

**Equipment for Treating Sewage.** William Sharp, Cleveland, Ohio; U. S. 2,415,048; Jan. 28, 1947 (Appl. 4-19-43). A system of air pipes and nozzles for the discharge of fine streams of bubbles to impinge on plates to further disperse the air in a tank used for aerating sewage.

**Production of Aliphatic Acids from Waste Sulphite Liquor.** Charles Weizmann, (to Butacet Ltd., London, England); U. S. 2,415,777; Feb. 11, 1947 (Appl. 3-22-43). Process of fermentation of waste sulphite liquor to produce aliphatic acids.

**Combined Sewage Settling and Digesting Tank Having an Inclined Apron Discharging into the Tank, An Effluent Channel, and an Inverted V-Shaped Baffle Extending Across the Tank Between the Apron and the Channel.** Carroll H. Coberly, Denver, Colo.; U. S. 2,416,867; Mar. 4, 1947 (Appl. 9-6-43).

**Sewage Clarifier.** Harold T. Jeffery (to Yeomans Bros. Co., Chicago, Ill.); U. S. 2,417,688; Mar. 18, 1947 (Appl. 9-30-43). A circular clarifying and settling tank with discharge at center and peripheral overflow weir, and rotary scraper mechanism for moving settled sludge to center for removal.

# N. J. SEWAGE WKS. ASSN. HOLDS 32nd MEETING AT TRENTON

## Pollution Laws, the New Sewer Authority Act, and Operators' Problems Featured

MORE than 315 persons attended the 32nd annual meeting of the N. J. Sewage Works Assn. held in Trenton, N. J. on Mar.

**President**
*L. J. Fontenelli*
*Supt. Treatment*
*Rahway, N. J.*

**Secy.-Treas.**
*M. S. Kachorsky*
*Supt. Sew. Wks.*
*Manville, N. J.*

19-21. Seventeen members of the Water and Sewage Works Manufacturers' Assn. had exhibits. On the evening preceding the technical sessions, a "Jam Session" with music and refreshments, and several unscheduled bridge games served as entertainment for the nearly one hundred early registrants.

### *Business Session*

The president and vice presidents of the N. J. Assn. served for two years, but two new members were elected to the executive committee. These new members were past-president Henry Van der Vliet, Supt. Maywood, N. J., and past-president P. N. Daniels, Supt., Trenton, N. J. M. S. Kachorsky, Supt., Manville, N. J., was re-elected Secretary-Treasurer for the ensuing year.

The Federation's Harrison P. Eddy Award for Research, was presented by Francis S. Friel, President of the Fed. Sew. Wks. Assns. to Dr. H. Heukelekian, Research Associate, N. J. Agr. Expr. Sta., New Brunswick, N. J. Dr. Heukelekian's research was reported in four issues of the *Sew. Wks. Jour.* in 1945 and presented the results of his studies of biological film on trickling filters of both the standard and high rate types.

### *N. J. Statutory Requirements*

The paper presenting the "Statutory Requirements and the General Policies of the State Department of Health Respecting the Correction and Control of the Pollution of the Waters of New Jersey" by **H. P. Croft,** Chief Engineer and **S. A. Kowalchik,** Prin. San. Engr. of the N. J. State Dept. of Health, was read by Mr. Kowalchik.

Mr. Kowalchik stated that there are four bodies of water (and their drainage basins) with which the State Dept. of Health is concerned and for which policy has been set in regard to pollution. These four bodies of water are the Delaware River, the Raritan River, the Hackensack River and the Atlantic Ocean including tide waters. Some of these tidal waters are under the jurisdiction of the Interstate Sanitation Commission (N. Y., N. J., and Conn.)

For interstate waters from which potable water supplies are drawn

**Vice-Presidents**

*Leslie West*
*Chief Engr.*
*Joint Meeting*
*Elizabeth, N. J.*

*John Struss*
*Supt.*
*Sewage Works*
*N. Wildwood, N. J.*

the department requires that sewage discharged therein must receive secondary treatment and chlorination. For non-potable receiving waters fine screening alone is *not* approved, the minimum requirement is effective sedimentation.

Several acts set forth the requirements and policies with respect to the individual streams. The Delaware river is divided into four zones, geographically, and standards for effluents are drawn for each zone. The Raritan River has two zones for both of which a limit is placed on the coliform bacterial content and the B.O.D. These limits would appear to require at least primary sedimentation and chlorination, but allow somewhat higher concentrations in one zone than in the other.

For the Hackensack River, secondary treatment and chlorination are required. The Barnegat Bay area requires primary and secondary treatment (intermittent sand filters) and chlorination.

Waters under the jurisdiction of the Interstate Sanitation Commission are divided into two classes: Class A waters being those which are expected to be used for recreational purposes, shellfish culture, or the development of fish life. Class "B" waters are designated as those not being used primarily for the purposes designated above. For Class "A" waters sewage effluents flowing thereinto are to have all floating solids and 60 per cent of the suspended solids removed, and shall have no more than one coliform per ml. in no more than 50 per cent of the samples tested, and further shall not reduce the dissolved oxygen content of the receiving waters to less than 50 per cent saturation.

For Class "B" waters floating solids and ten per cent of the suspended matter is to be removed and the dissolved oxygen content of the receiving water is not to be reduced to less than 30 per cent saturation. Effluents discharged into the Atlantic Ocean must be discharged at least 1000 ft. offshore.

### *Stream Pollution Abatement In N. J.*

**Prof. H. N. Lendall,** Head, Civil Engineering, Rutgers Univ., New Brunswick, N. J., reviewed the "Abatement of Stream Pollution in New Jersey." This review contained a general comment on the subject of stream pollution and the various

**Elected to Exec. Committee**

*H. Van der Vliet*
*Supt.*
*Sewage Works*
*Maywood, N. J.*

*P. N. Daniels*
*Supt.*
*Sewage Works*
*Trenton, N. J.*

*"Bob" Merz*
*Chain-Belt Co.*
*New York*

*Henry Van der Vliet*
*Supt. Sew. Works*
*Maywood, N. J.*

*Connie Bergen*
*Chain-Belt Co.*
*New York*

*From Rutgers Univ.*
*Dept. of Water & Sewage Research*
*(Rear)*
*Anthony Palludino*
*and*
*Lloyd Falk*
*Research Assistants*
*(Front)*
*H. Heukelekian, Professor*
*and*
*R. P. Logan, Asst. Prof.*

*From Freeport, L. I.*

*Mike J. Coffee*
*Supt. Public Wks.*

*Frank H. Holland*
*Commissioner*

*Ed. C. McKeeman*
*Supt. Treatment*
*(Vice-President, N. Y. Sew. Wks. Assn.)*

Federal bills that had been introduced in Congress for the control of pollution. Prof. Lendall also reviewed the New Jersey Laws, briefing the material which had been presented by Mr. Kowalchik. As the new engineering member of the N. J. State Board of Health, Prof. Lendall pointed with pride to the advances that had been made in the state, and emphasized the soundness of the legislation that had been adopted for New Jersey. Industry, he said, had been very cooperative and such cooperation is expected to increase.

### *The Case Against Federal Control*

The results in stream pollution abatement in New Jersey show why Federal Stream Pollution Control is unnecessary, according to **Louis Auerbacher, Jr.**, Counsel, Passaic Valley Sewerage Commissioners, Newark, N. J. Mr. Auerbacher spoke on "The Case Against Federal Control of Stream Pollution." The Passaic Valley Commission serves one million persons, has spent $25 million and is strongly against Federal control. The several reasons for this opposition were set forth by Mr. Auerbacher as follows:

1. Whereas proponents of Federal control point to the tremendous amount of pollution not now being handled, and cite the failure of the Ohio River compact between States as an instance which points up the need for Federal control as the only means of obtaining desired results, Mr. Auerbacher pointed out that there have been great strides in many states and cities elsewhere in the country. These strides have all been obtained without Federal control.

2. The Federal Government can't finance any program of remedial measures and remain solvent. Cities and states have more money and better borrowing power than does the Federal government.

3. While Federal money is being held out as the bait to obtain support for these measures, it should be remembered that Federal control of monies means that at least four governmental bureaus or agencies will have to review any plans put forward. Such bureaucratic review is wasteful of time, money, and initiative. Such control by Federal bureaus results in delays and interference with the actual construction of any remedial measure.

**Federation Pres.**
*Francis S. Friel*
*Consulting Engr.*
*Philadelphia*

**Honored**
*H. Heukelekian*
*Dept. Water & Sew.*
*Rutgers Univ.*

*(In behalf of the Sewage Wks. Federation President Friel presented to Dr. Heukelekian the H. P. Eddy Award for Outstanding Research.)*

4. While the proposed legislation holds out Federal financial aid as bait, there is nothing in the laws which will assure anyone that Congress will actually appropriate any money. Thus while cities and industries may feel the allure of Federal aid they may not get it and the net result will be delay in the construction of needed works.

5. Under one of the proposed bills (HR 123) there is set up the power to order work to be done and if no action is taken within two years, the U. S. can sue. This is the "foot in the door." Once in operation it may be expected that the powers of the government will be broadened to cover all waters not just those of interstate nature.

6. Proponents of the Federal legislation say that the states cannot control inter-state waters, but according to Mr. Auerbacher, there is now an existing remedy whereby a city in one state can obtain an injunction against a city in another state. This is sufficient for the control of interstate waters.

7. The advisory board for the control of these pollution problems under Federal law is for the most part appointed by the Surgeon General. This arrangement can exclude any representation of cities, states, or industry and is an undemocratic provision.

8. By and large the problems of stream pollution are strictly local and can be solved by local areas without pressure or force by the Federal government.

9. An example of the possible unfairness of such a system of control is to be found in the Passaic Valley Commission, where all sewage receives primary treatment. Under Federal Acts, this commission could be forced to place secondary treatment in operation, while New York City might continue to discharge primary treated sewage into the same general bodies of water. This would be unfair discrimination and while it might not take place it would be possible under the proposed Federal legislation.

10. One last objection to this proposed legislation, as the Passaic Valley Commission sees it, is the fact that whereas Passaic Valley has already spent $25 million on its own work its residents would have to contribute (through taxes)

*Geo. H. Boone*
*Supt.*
*Sewage Works*
*Norristown, Pa.*
*and*
*Stanley Pearson*
*Supt.*
*Sewage Works*
*Conshohocken, Pa.*

*P. N. Daniels*
*Supt.*
*Sewage Works*
*Trenton, N. J.*
*and*
*"Ted" Wilson*
*Distr. Mgr.*
*Pa. Salt Co.*
*Philadelphia*

*Harold K. Gatley*
*Cons. Engr.*
*Maplewood, N. J.*
*and*
*Wellington Donaldson*
*Chief of Design*
*Sewage Works*
*Dept. Public Wks.*
*New York City*

*"Ken" Adams*
*Supt.*
*Sewage Works*
*Tenafly, N. J.*
*and*
*"Art" Lehman*
*Supt.*
*Sewage Works*
*Hackensack, N. J.*

*H. P. Croft*
*Chief Engr.*
*State Health Dept.*
*Trenton, N. J.*

*W. Allan Darby*
*Sanitary Engr.*
*The Dorr Co.*
*New York*

*H. E. Russell*
*Attorney*
*Hawkins & Wood*
*New York*

*A. E. Griffin*
*Development Dept.*
*Wallace & Tiernan*
*Newark, N. J.*

**Programmers**

*Robt. C. Merz*
*Sales Engr.*
*Chain-Belt Co.*
*New York*

*Harry N. Lendall*
*Prof. San. Eng.*
*Rutgers Univ.*
*NewBrunswick,N.J.*

to Federal funds used to help other communities.

Thus did Mr. Auerbacher present the case against federal control of stream pollution.

### *The Sewer Authority Act*

The Sewer Authority Act for New Jersey was authored by **Henry E. Russell,** member of the firm of Hawkins, Delafield & Wood, New York City. Mr. Russell explained the Act to the N. J. S. W. A. audience and pointed out that under this Act, the work of consulting engineers and legal advisors was doubled because, (particularly as far as the engineers are concerned), practically the whole proper functioning of a Sewer Authority depends on the plans and estimates of engineers for its future operation and success.

The act permits municipalities or groups of municipalities to form a district for the collection and treatment of sewage and wastes. Such an Authority, when created, becomes a new corporation with no money and without legal life; it has a duty to abate pollution in that area; it can plan treatment for all wastes in that area; it can borrow money on its own credit as a political subdivision and set charges for construction, service and maintenance.

Under the N. J. Act, an Authority can take over existing sewers under arrangement with the present owners, by lease, gift, or purchase, or it can merely operate a treatment works and have no concern with the actual collection of the wastes.

Bonds are the only indebtedness of an Authority, and these may be paid off solely out of monies collected by the Authority for service. Service charges are to be uniform to all where more than one municipality is involved. Special charges may be made for industrial wastes or wastes of excessive volume or concentration.

**Symposium Chairmen**

*Sol Seid*
*Supt.*
*Treatment Wks.*
*NewBrunswick,N.J.*

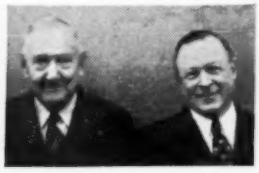
*"Doc" Symons*
*Assoc. Editor*
*"Wat. & Sew. Wks."*
*New York*

Mr. Russell emphasized the big job engineers have in setting up the whole district, and the basis for charges. In fact bond buyers will not purchase the bonds except on the basis of an engineer's report which presents a proper picture of the future fiscal picture of the authority. There is also the problem of vacant land charges, time of construction, cost of construction, and cost of operation to be considered by the engineer in the preparation of such a report.

In the discussion of this topic by **Walter R. Darby,** Director of Local Government, N. J. State Dept. of Taxation and Finance, it was brought out that Sewer Authority bonds are not supported by taxation and this is the first time that New Jersey has ever permitted the issuance of revenue bonds. Bonds of this type do not impair municipal credit or borrowing power. Mr. Darby stressed the need for good engineers but added that others such as legal advisors, finance advisors, etc. were also important, and he cautioned persons contemplating taking advantage of the act to go slowly, and avoid mistakes as "the people have to pay for it."

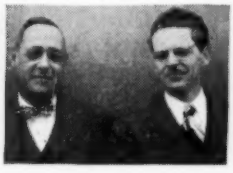
**Robert F. Darby, Esq.,** Counsel for Rahway Valley Joint Meeting, explained how that Joint Meeting planned to change over to operation under the Sewer Authority Act. The Rahway Valley Joint Meeting treats the sewage of nine communities and it is planned to have the municipalities continue to collect the sewage and the new Authority will treat the wastes. Present sewer systems appear to be of sufficient size but the treatment plant is overloaded. Ques-

*Geo. Fredericks*
*Supt. Sewage Wks.*
*Naval Supply Depot*
*Bayonne, N. J.*
*and*
*Sam Cenicola*
*Supt.*
*Sewage Works*
*So. Hackensack, N. J.*



*"Bill" Egenrouch*
*Operator*
*E. Rutherford, N. J.*
*and*
*"Ray" G. Case*
*Supt.*
*Sewage Works*
*Merchantville, N. J.*

*Registration*
*Desk*
*32nd*
*Annual*
*Meeting*
*N. J.*
*Sewage Works*
*Assn.*



*T. "Duke" Nathan*
*Chief Engr.*
*Hamilton Kent Mfg. Co.*
*Kent, Ohio*
*and*
*Elmer Leuliette*
*Univ. Concrete Pipe Co.*
*New York*

*Arthur J. Carr*
*Supt. of Water*
*Ridgewood, N. J.*
*and*
*Albert J. Faber*
*Comm. Public Wks.*
*Ridgewood, N. J.*

*Paul Molitor*
*Supt.*
*Treatment Wks.*
*E. Rutherford, N.J.*

*John Hood*
*Supt.*
*Treatment Wks.*
*Ridgewood, N. J.*

*Arthur Lehman*
*Supt.*
*Treatment Wks.*
*Hackensack, N. J.*

*John R. Downes*
*Supt.*
*Treatment Wks.*
*Plainfield, N. J.*

**Operator Symposium Participants**

tions yet to be settled are how to adjust the present interest of the various municipalities in the treatment works as it is turned over to the new Authority. Most of these problems are of legal nature and may be solved in several ways, but when the transfer is finally made the new Authority will charge the several municipalities for service, and it will be the responsibility of the individual communities to collect from individual sewer users either by a service charge or by taxation.

**Frederick V. Hugo,** Secy. Joint Meeting Rutherford, East Rutherford, and Carlstadt, N. J., spoke on the operation of that Joint Meeting and explained how it seemed preferable to operate under a commission form. (Note: A commission form is not the same as a Sewer Authority). The cost of operation is low, the budget for this 1.25 mgd. plant is only $50,000 a year. Administration costs are only $1950 a year at the Rutherford Joint Meeting.

### *Operators' Symposium*

Under the leadership of **Leslie E. West,** Chief Engineer Joint Meeting for Certain Municipalities in Essex and Union Counties, and **Sol Seid,** Supt. of Treatment, New Brunswick, N. J., a guided discussion of operators' problems was held. Mr. West guided the session on Primary Treatment Problems, and Mr. Seid presided over the discussion of Sludge Digestion.

First question discussed pertained to *Flow Measurement and Control.* In introducing the subject Mr. West mentioned that venturi meters are less accurate at low flows, and that the accuracy of the flow can be checked by connecting water manometer tubes to the venturi. In reference to storm flows the story was told of how in one area where municipalities pay for service on the basis of flow, it was found that the charges were higher to that community during the past year when the seasons were drier and storm flow was less. This apparent anomoly existed because at the higher flows a bypass weir became effective and less actual flow went down the sewer to be charged for.

**Chief Registrar**

*Frank Van Orden*
*Supt., Treatment Wks.*
*Bernardsville, N. J.*
*(In Charge of Registration)*

When **John Hood,** Supt. of Ridgewood, said they hoped to handle all storm flows in the future but now bypassed such flows, Prof. Willem Rudolfs, Director, N. J. Agr. Expt. Sta., asked what per cent of the time bypasses actually operated. No one seemed to know the answer, but L. J. Fontenelli, Supt. at the Rahway Valley Plant, said that in his community the bypasses worked whenever the flow was more than 165 per cent of the average. This might occur on 25 or 30 days in a year but not necessarily for the entire 24 hour period on those days. Paul Molitor, Supt. Rutherford, said their plant had no bypass but had a diversion weir for high flows. All sewage is pumped at Rutherford and at the high flows the chemical dosage is increased.

### *Screenings*

**John Downes,** Supt., Plainfield, says that with fine screens there was a considerable problem to handle the screenings. The installation of comminutors eliminated the problems. **Sol Seid** reported that where screening difficulties had been traced to an industrial waste, arrangements had been made with the industry to control the discharge of the offending material. **John Hood** spoke up to say that in his plant mechanical screening had involved too much maintenance and power and that the problem had been solved by installing comminutors, which had worked very satisfactorily when grit was removed ahead of the comminutors. Maintenance of these units cost very little according to Mr. Hood and results are highly satisfactory.

### *Rat Problems*

L. E. West says there are far more rats around a sewage plant than one suspects and that the screenings when unburied attract rats. To combat rat infestation Mr. West first prepares pellets containing horse meat, and these are placed about the plant where rats are suspected. These baits are placed for two nights and the number of rats estimated from the number of baits disappearing. The third night similar pellets are placed in the same positions about the plant, but these pellets contain not only horse meat but powdered barium carbonate in the ratio of 50 per cent of each. That is the end of the rats for a number of weeks until gradually

*I. M. Glace*
*Cons. Engr.*
*Harrisburg, Pa.*

*Kenneth Adams*
*Supt.*
*Sewage Works*
*Tenafly, N. J.*

*Lee T. Purcell*
*Consulting*
*San. Engr.-Chemist*
*Wanaque, N. J.*

*Jas. Entwhistle*
*Supt.*
*Sewage Works*
*New Milford, N. J.*

*Elson T. Killam*
*Consulting Engr.*
*New York, N. Y.*

*John Duane*
*Supt.*
*Sewage Works*
*Bergenfield, N. J.*

*John Woodward*
*Supt.*
*Treatment Works*
*U.S.N. Air Sta.*
*Willow Grove, Pa.*

*Geo. H. Boone*
*Supt.*
*Sewage Works*
*Norristown, N. J.*

*Rolf Eliassen*
*Professor*
*San. Engineering*
*New York Univ.*
*New York*

*Sam Probasco*
*City Engineer*
*Burlington, N. J.*

*"Dick" Burr*
*Sales Engr.*
*American Brass Co.*
*Waterbury, Conn.*

a new set of rat inhabitants move into the plant grounds.

### *Settling Tanks and Sludge Collection*

**Art. Lehman,** Supt. Hackensack Sew. Treat., related his experiences with sludge rising in the settling tanks. Remedial measures adopted to combat this difficulty consisted of more frequent pumping (five min. out of each hour) and sampling every fourth hour. These samples are centrifuged and so long as the estimated solids content of the sludge (based on the centrifuge test) were 4 to 4.5 per cent no change in pumping schedule was made.

**John Hood** explained that automatic pumping was used to try to get uniform removal, but that collectors had to operate continuously to make the system work. Pumping is scheduled for three minutes out of every hour, being stepped up by manual control when the sludge becomes thicker than 5 to 6 per cent solids.

**Charles Barron,** Army Engineers' Supt. of Governor's Island, has an uneven floor in his settling tank and to prevent the deposit of sludge in the low areas, flexible flaps were added to the bottom of the collector arms and scrapers; these fold up in the high side of the tank and drop down to move the sludge on the low side.

### *Sludge Digestion and Disposal*

Under the leadership of Sol Seid of New Brunswick, the question of capacity of digesters was discussed. **L. J. Fontenelli,** operator, Garwood, N. J., told how overloading of digestors was ameliorated by increasing the sludge solids from 5 to 7.5 per cent in the settling tanks. This cut the volume of raw sludge entering the digesters by fifty per cent, and effected a digester capacity of 1.2 cu. ft. per capita. These tanks are operated to provide two-stage digestion, and laboratory experiments are used to control the feeding. Fontenelli is also using two deep lagoons which act as open digestion tanks—i.e., providing overall, a three-stage digestion operation.

**"He Who Shooteth Gets Shot!"**
*"Victim," holding Contax III, is John Duane getting on Ye Ed's record (see first shot in strip on this page) while one "Duke" Donaldson makes a candid shot from the hip of this very typical "Operation Enslow."*

### *Lime in Digesters???*

**Dr. Heukelekian** raised a question about the use of lime in sludge digestion tanks. Mr. Fontenelli said that he used approximately 650 lb. of lime to 13,000 lb. of solids (dry basis) transferred to the digesters.

As to the need for lime in digesters **Dr. Willem Rudolfs** said that apparently it was not needed where there are hard waters, but that it seems to be necessary where the water is soft and the digestion capacity is low. Where the storage capacity is on the high side, and a large balance of sludge can be held in the digesters to buffer input of green solids lime is not necessary to maintain alkaline digestion.

### *Sludge Tank Heating*

Several persons reported exterior scaling of sludge digestion coils, while one found heavy scale on the inside of the coil, deposited from the hardness of the water. This scale had reached ⅛ in. thickness in five years. Another operator found a heavy deposit of scale on the outside of the coil. This scale apparently was caused by deposition and caking of the sludge on coils carrying water at 150 deg. F. or more. Mr. Lehman, Supt. at Hackensack, noted that in winter his sludge (activated and primary) doesn't thicken and contains about 5 per cent higher volatile matter content than in the summer. Temperatures of the digesters are some 15 degrees colder in winter than in summer.

**John R. Downes** commented that this is a terrific drop in temperatures for digesters. [-and, we would add, indicates the general need for better practice in insulating digesters if rates of digestion are to be maintained without critical loss of gas available for engine operation.]

### *Sludge Disposal*

Sol Seid (New Brunswick) told of experiments on various filter cloths. Six different types of Nylon cloth had been tried. Whereas a cotton cloth lasted but 70 hours, a Nylon cloth ran for 456 hours, was removed, washed and returned to service for an additional 300 hours. Although the cost of Nylon cloth is five to six times that of cotton, its cost per filter hour operation was far lower, and it reduced the frequency of reclothing, produced a better sludge and required less maintenance.

John Downes is of the opinion that the cord filter is the best idea in sludge filtration equipment but no one present knew the life of the cord or the cost of installing the equipment on different size filters. One person stated that an estimated installation cost for a 6 by 4 ft. filter was $3600.

Both Sol Seid and John Struss emphasized the advantages gained by utilizing small local repair shops for maintenance and repair rather than to wait for repair service from large equipment manufacturers.

Limited time prevented completion of the discussion of this topic of sludge disposal and two other topics, chlorination, and secondary treatment were not discussed at all.

### *Manufacturers' Symposium*

A manufacturers' symposium was arranged under the auspices of Arthur T. Clark, Secy.-Manager, Water and Sewage Works Manufacturers' Assn. This session was presided over by **George E. (Doc) Symons,** Assoc. Editor, *Water & Sewage Works.*

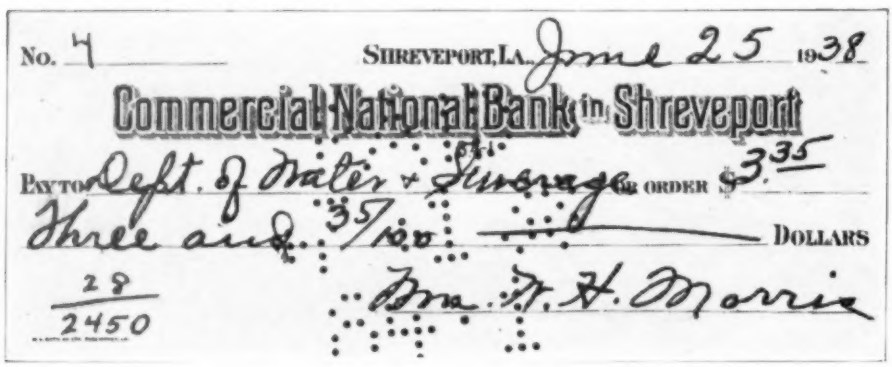
**R. C. Merz,** San. Engr., Chain Belt Co., presented a discussion of the "Design Principles of the Rex Verti-Flo Settling Tank." This particular tank which has been successfully operated in water softening plants is also offered as a secondary settling tank. Its characteristics of upward flow, and long weir length, (low overflow rate) should be particularly effective to overcome the problem of density currents in final tanks. The Verti-Flo is, however, not recommended as a primary settling tank.

**W. A. Darby** of the Dorr Co. used slides to show the design, construction, installation and operation of the Dorrco "Clarigester." This is a combination settling tank and digester recommended for small installations where little operating attention can be given. Combining the features of a two story Imhoff type tank with the advantages of separate sludge digestion, the equipment appears to offer much in the way of simplicity for the small plant, particularly of the institutional type.

**A. E. Griffin** demonstrated the O-T-A Chlorine Residual Tester. This is the piece of laboratory apparatus designed recently by Wallace & Tiernan Co. The apparatus is designed to be used for the determination of combined available residual chlorine and free available residual chlorine, and discloses interfering substances in the chlorine test. It uses the orthotolidine-arsenite test now a standard technic. By changing color discs the apparatus may also be used to determine pH. As an aid to reading colors, an eyepiece is added to the apparatus. Although the differentiation of combined and residual chlorine is not yet practiced in sewage treatment, it may be at some time and Mr. Griffin's demonstration was of considerable interest.

## Small World!

(In Which We Discover Some Charming Neighbors)


No. 4 SHREVEPORT, LA. June 25 1938

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Wm. W. H. Morris

Early last summer the writer purchased a house in Jackson Heights, L. I., and moved in. One day early thereafter, while working out in the yard, a thunder-storm came up and a bit of paper came fluttering in on the wind. Picking up this bit of paper, imagine the writer's surprise to find it to be a somewhat dampened cancelled check which had been used to pay a water bill in Shreveport, La., by one W. H. Morris (see cut).

We were inquisitive and learned that the "Will" Morrises, formerly of Shreveport, La., were nearby neighbors. So we called on the Morrises and discovered two very charming neighbors, all because of the fact that an old cancelled check used in payment of a water bill had fluttered into the yard of one editor of a water works magazine.

Of course, one of the first questions put to our newly found neighbors was, "Did you know Mr. Tom Amiss, Supt. of the Shreveport Dept. of Water and Sewerage?" The answer was, "Why, who in Shreveport doesn't know Tom Amiss?"

We thought the experience interesting, so we mailed the cancelled check to Tom Amiss and told him the story. In return we received a copy of the original bill, showing May 15-June 15, 1938, 2000 cu. ft. consumption at $3.75 less 10 per cent for payment within 10 days. Also the *Shreveport Times* thought the story worth a little space because the Morrises had been well known in Shreveport. And this is the story of one little wandering check up on Long Island which had been used to pay a water bill in Shreveport, La.

—L. H. E.

## Indianapolis to Modernize Sewer System

Blaine H. Miller, president of the Indianapolis Board of Public Works and Sanitation, was named by Mayor Robert H. Tyndall to head a 12-member commission to supervise the city's $27,000,000 sewer modernization program.

The commission will study the city's present sewer system to determine the sections needing overhauling and repair and to assign priorities for the carrying out of the program. The commission will use data gathered from a two-year study of the sewer system as a working basis.

This sewer rehabilitation program has been given priority over all other public works projects by the Mayor. Some of the sewers were laid more than one hundred years ago and have become overburdened with extension of the city's boundaries.

In addition to the president of the Indianapolis City Council, several city councilmen and the city engineer, W. H. Frazier, superintendent of the city sewage plant, were also named to the committee.

## Albright & Friel Move Office

Albright & Friel, Inc., Consulting Engineers, Philadelphia, Pa., moved their offices on March 29 from 1520 Locust St., to Suite 816-822, 1528 Walnut St., Philadelphia, Pa. Mr. Friel is well known as the President of the Federation of Sewage Works Associations.

# SCUM ACCUMULATION RESPONSIBLE FOR RUPTURED DIGESTER

By JOHN G. ALBERTSON*
Consulting Engineer
NEW YORK, N. Y.

The Sewage Treatment Plant of Highland Falls, N. Y.

THE accompanying photograph of the primary digester at the Highland Falls, New York, Sewage Treatment Plant reveals what can happen when outlets of a fixed-roof digester are sealed by a heavy scum formation and sludge is pumped into the tank, creating an excessive internal pressure.

The Highland Falls plant, which provides primary treatment for domestic sewage from a population of about 3,000 persons, was placed in operation during 1936. Because of a damaged boiler, no heat was applied to the tank after March, 1946. By October of the same year, scum had formed to such an extent that the gears failed in the reducing mechanism which operates the scum breaker. On January 29, 1947, while pumping sludge, the operator observed the phenomenon of the earth around the digester separating and the top of this reinforced concrete tank rising to a height of eight inches. And the operator was not a drinking man.

With outlets sealed by the heavy scum blanket, the tank became a closed hydraulic cylinder. Sludge delivered to the digester by a plunger pump caused the internal pressure to rupture the tank roof. The roof was designed to withstand a minimum pressure of 1,500 pounds per square foot. That the tank was subjected to at least this pressure was evidenced by the fact that after partial relief was obtained by failure of the concrete, top sludge (scum) was forced to a height of 10 to 15 feet in the air upon removal of the gas dome.

The accident may be classified as a war casualty due to inability to obtain replacement parts promptly. However, it should emphasize the need for safety precautions in digester operation if possible damage to the structure is to be avoided. After failure, first of heating devices and thereafter of the stirring mechanism, the sludge should have been broken up by use of water under pressure. This experience would also seem to point to the desirability of having a pressure indicator of some nature on the sludge pump discharge line, if not also a pressure alarm of some sort.

The plant, which has a scenic setting overlooking the Hudson River, was designed by Bowe, Albertson & Associates, Engineers, of N. Y. City.

Close-up of the Ruptured Digester

*Bowe, Albertson & Associates.

## Ingols Goes to Georgia Tech

Dr. Robert S. Ingols has been appointed Research Associate Professor of Sanitary Chemistry at Georgia Institute of Technology. Dr. Ingols, a graduate of Bucknell University, received an M.A. from Columbia in 1934, an M.S. from Rutgers in 1937, and a Ph.D. from Rutgers in 1939. Until recently Dr. Ingols has been associate professor in the Public Health School at the University of Michigan.

Prior to his association with the University of Michigan, Dr. Ingols was with the New Jersey Experiment Station, the Hackensack Sewage Treatment Plant, and the Florida Citrus Commission.

One of the first undertakings of Dr. Ingols at Georgia Tech will be a survey of analytical methods for sewage analysis.

# Comments of the Editors

## *This Matter of Good Will*

At a recent meeting of water works men where the matter of developing better public relations was being discussed a Water Commissioner raised the question as to whether or not there was any real need to court the public favor in respect to a water supply which is, first, a monopoly and, second, a publicly owned and operated enterprise. He questioned the advisability of a publicly owned water utility incurring any extra expense in attempting a so-called "Better Public Relations Program." He raised the question—"Could this sort of expense be afforded by a publicly owned water utility?"

The writer could hardly believe his ears when hearing this argument and question. The speaker was a stranger to the writer, but it was only with restraint that he waited for others to answer this man. The writer's urge was to jump to his feet with the statement that the *real* question seemed to him to be just the opposite to that raised by the speaker. That is, to this writer's thinking in the interest of a sorely needed improved status of many municipally owned water utilities, and the standing of water supply service in the majority of communities, the question is *not*—"Can this sort of expense be afforded by the publicly owned water utility?" but, rather it seems the question should be—"Can the management of a publicly owned water utility afford *not* to go to some expense in order to gain the good-will of the water taker, and the greater confidence of the general public in what with every justification should be considered the highest and most reasonably supplied service of the municipality to citizens."

When we advocate spending money to better public relations we are not necessarily thinking of any extensive use of paid newspaper advertising, although it is only to be expected that if the newspaper management is wholly cooperative in the matter of publishing articles and items of interest concerning the local water supply system and service to the community, then it is only reasonable to support the publication with a moderate amount of paid advertising.

As a matter of fact there are numerous other ways (even more important immediate ways) in which expenditures can be effectively made in developing better public relations for the water utility. In any program that is developed there will always be some added expense in terms of money, or employees' time, or both. For instance, it costs something extra to give adequate notice to customers in advance of the shutting off of service incident to making main repairs, etc. It also costs something extra to repaint fire hydrants, elevated tanks, or other water works structures more frequently, so as to impress the public that the system is well maintained and that the management is an efficient one. It costs something extra to have courteous, well trained and neatly attired employees make calls in response to customers' complaints, and take perhaps some extra time in making investigations and explaining matters to the customer. The same thing may be said of the necessity, perhaps, of developing employees for the specific purpose of receiving those who come to the office with complaints. In the smaller municipalities one individual can serve in both capacities. If he should be out at the time the complainant comes into the office, an appointment can be made for another day or hour. And, if more convenient, the appointment can be made for a call at the customer's home or office. Usually it is far more effective for the complaint employee to call on the customer than the reverse. Such calls become "service" in the minds of those called upon. Furthermore, the atmosphere is apt to be far more friendly in the customer's home or office than in the water utility office. In the smallest communities it will probably be more expedient for the superintendent to handle complaints, even though he should have to employ an extra person to relieve him by taking over some of his other duties.

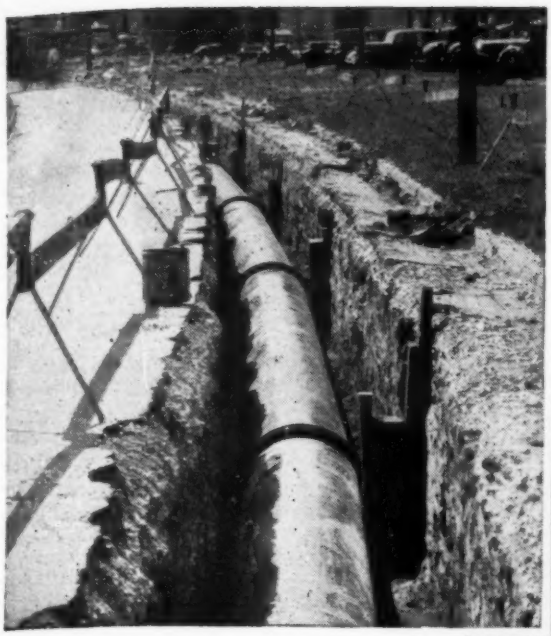
It costs something extra to keep the office and the customers' lobby clean, neat and well-dusted at all times —to keep the front window clean and shining and, perhaps, to maintain some growing plants in the lobby, or in the window, or in the pumping stations and filtration plants. It costs something more to keep these stations and plants clean, neat and well painted, and to maintain the grounds in attractive condition. It costs something extra to handle street excavations and trench filling neatly, so as to present the least hazard or inconvenience to the public; and it costs something extra to prevent injury to parking and lawns when replacing service lines, etc. It costs something more to give the water the best known treatment to destroy bad tastes or odors and to insure an attractive sparkling water at all times.

All of these things (niceties some may term them) cost something extra—and there are many others that might be named when cataloging those things which can be done to improve public relations. That water utility manager who argues that such niceties constitute an unnecessary and questionable expense should in this writer's opinion early learn, for his own ultimate good as well as that of his staff, that he should make a change. We say this because it is our own sincere belief that the water utility manager of the future who is not inherently public relations minded has no place in the management of a public utility.

Getting back to the matter of whether additional expense to the water utility be justified in order that this important enterprise be lifted to a more deserved status in the public mind, it was refreshing to hear E. V. Buchanan, manager of Public Utilities, London, Ontario, at the recent meeting of the Canadian Section of A.W.W.A. inject into the discussion on public relations the matter of penalty charges to water customers —termed "nuisance charges." A point was made of the fact that as far as they in London were concerned the paltry per cent of total income which London has been collecting in the form of penalty fees from water users in contrast with the ill will which the collection of such nuisance charges create, constituted the best possible argument for their elimination.

Elsewhere in this issue is an article which discusses "Public Relations and the Superintendent's Responsibility." The author is the president elect of the Am. Water Works Association, N. T. Veatch of Kansas City, Mo. This article reflects some of the thoughts that are uppermost now in the minds of A.W.W.A.'s officers and board members who voted to use some of the reserve funds of the Association to finance a special project which comprises the series of brochures on "Public Relations" presently going to all A.W.W.A. members.

L. H. Enslow



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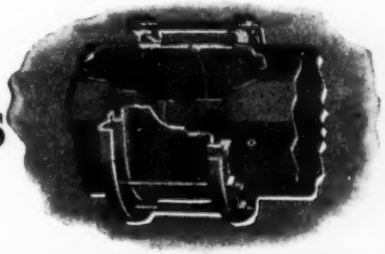

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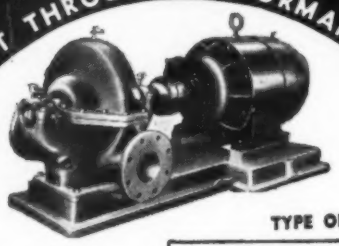

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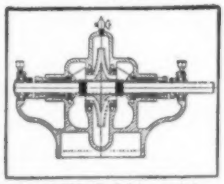

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# MEETINGS SCHEDULED

Apr. 23-24—HAVRE, MONTANA (Havre Hotel)
**Montana Sewage Works Association.** Sec'y-Treas., H. B. Foote, State Board of Health, Helena, Mont.

Apr. 25-26—HAVRE, MONTANA (Havre Hotel)
**Montana Section A.W.W.A.** Sec'y, C. W. Brinck, State Board of Health, Helena, Mont.

May 2—SALEM, N. J. (Country Club)
**South Jersey Assn. Water Supts.** (Annual Meeting). Sec'y, Walter Spencer, 2707 Bethel Ave., Merchantville, N. J.

May 5-6—ANN ARBOR, MICH. (Univ. of Michigan, School of Public Health)
**2nd Inservice Training Course for Water Works Personnel.** Director, H. E. Miller, Univ. of Michigan, Ann Arbor, Mich.

May 7-9—INDIANAPOLIS, IND. (Antlers Hotel)
**Indiana Section A.W.W.A.** Sec'y, Charles H. Bechert, 200 Underwriters Bldg., Indianapolis 4, Ind.

May 8—MORRISVILLE, PA.
**Penna. Water Works Operators' Assn.** (Eastern Section) Sec'y, I. M. Glace, 1001 N. Front St., Harrisburg, Pa. Meet at Morrisville Water Plant, 1 p. m. Visit DeLaval Plant thereafter. Technical Session after dinner.

May 15-16—WASHINGTON, D. C. (Hamilton Hotel)
**Maryland-Delaware Water & Sewerage Assn.** Sec'y-Treas., E. Virginia Gipe, State Dept. of Health, 2411 N. Charles St., Baltimore, Md.

May 15-17—VICTORIA, B. C. (Empress Hotel)
**Pacific Northwest Section A.W.W.A.** Sec'y, Prof. Fred Merryfield, Oregon State College, Corvallis, Ore.

May 21-22—LAFAYETTE, IND. (Memorial Union Bldg., Purdue Univ.)
**Third Industrial Waste Utilization Conference.** Gen. Chairman, Prof. Don E. Bloodgood, Purdue University, Lafayette, Ind.

May 22—MANCHESTER, N. H. (Country Club)
**New England Water Works Assn.** Sec'y, Jos. C. Knox, 609 Statler Bldg., Boston, Mass.

May 26-27—ALBANY N. Y. (Hotel Ten Eyck) (Joint Meeting)
**New York State Sewage Works Association.** Sec'y, A. F. Dappert, State Dept. Health, Albany, N. Y.
**New England Sewage Works Association.** Sec'y, W. E. Merrill, 611A State House, Boston, Mass.

June 11—ROCKLAND, ME.
**Maine Water Utilities Assn.** Sec'y, Earle A. Tarr, Winthrop, Me.

June 12-13—PITTSBURGH, PA. (Roosevelt Hotel)
**Western Penna. Section A.W.W.A.** Sec'y-Treas., Earle P. Johnson, 418 Flannery Bldg., Pittsburgh, Pa.

June 12-14—UNIVERSITY, ALA. (University of Alabama)
**Alabama Water & Sewage Association.** Alex O. Taylor, Director of Eng. Extension Service, Ala. Polytechnic Institute, Auburn, Ala.

June 18-20—BATON ROUGE, LA. (Louisiana State Univ.)
**Tenth Annual Water & Sewage Short Course.** Director, John H. O'Neill, Dept. Public Health, P. O. Box 630, New Orleans 7, La.

June 19—BOONTON, N. J.
**N. J. Section A.W.W.A. Outing.** Sec'y, C. B. Tygert, Box 178, Newark, N. J.

June 20-21—DULUTH, MINN. (Spalding Hotel)
**Central States Sewage Works Assn.** Sec'y, P. W. Reed, 1098 W. Michigan Ave., Indianapolis, Ind.

July 21-25—SAN FRANCISCO, CALIF. (Auditorium)
**American Water Works Association 1947 Conference.** Executive-Secretary, Harry E. Jordan, 500 Fifth Ave., New York 18, N. Y.

July 22-24—SAN FRANCISCO, CALIF. (Auditorium)
**Federation of Sewage Works Associations.** (20th Annual Meeting.) Executive-Secretary, W. H. Wisely, 325 Illinois Bldg., Champaign, Ill.
(Meetings and Exhibits in the Auditorium.) Application blanks for hotel accommodations may be obtained from the respective Association Headquarters.

# MEETINGS SCHEDULED

Aug. 13—CARIBOU, ME.
**Maine Water Utilities Assn.** Sec'y, Earle A. Tarr, Winthrop, Me.

Aug. 25-27—STATE COLLEGE, PA. (Nittany Lion Inn)
**Pennsylvania Sewage Works Assn.** Sec'y-Treas., Bernard S. Bush, Kirby Health Center, Wilkes-Barre, Pa.

Aug. 27-29—STATE COLLEGE, PA. (Nittany Lion Inn)
**Pennsylvania Water Works Operators' Assn.** Sec'y, I. M. Glace, 1001 Front Street, Harrisburg, Pa.

Sept. 16-19—BOSTON, MASS. (Statler Hotel)
**New England Water Works Assn.** Sec'y, Jos. C. Knox, 609 Statler Bldg., Boston, Mass.

Sept. 17-19—ATLANTA, GA. (Ga. School of Technology)
**Annual Water & Sewage School.** Sec'y, Van P. Enloe, Rt. 5, Box 363, Atlanta, Ga.

Sept. 18-20—BAY CITY, MICH.
**Michigan Section A.W.W.A.** Sec'y, R. J. Faust, State Dept. of Health, Lansing, Mich.

Sept. 22-24—LOUISVILLE, KY.
**Kentucky-Tennessee Section A.W.W.A.** Sec'y, R. P. Farrell, 420 6th Ave., N., Nashville 3, Tenn.

Sept. 30-Oct. 1—COLUMBUS, OHIO.
**Ohio Section A.W.W.A.** Sec'y-Treas., F. P. Fischer, 812 Perry Payne Bldg., Cleveland, Ohio.

Oct. 2-3—COLUMBUS, OHIO.
**Ohio Conference on Sewage Treatment.** Sec'y-Treas., L. B. Barnes, 441 S. Prospect St., Bowling Green, Ohio.

Oct. 6-10—ATLANTIC CITY, N. J. (Convention Hall)
**American Public Health Association.** (75th Annual Meeting.) Exec.-Sec'y, Reginald M. Atwater, M. D., 1790 Broadway, New York, N. Y.

Oct. 8—DOVER-FOXCROFT, ME.
**Maine Water Utilities Assn.** Sec'y, Earle A. Tarr, Winthrop, Me.

Oct. 9-11—CEDAR RAPIDS, IOWA.
**Iowa Section A.W.W.A.** Sec'y-Treas., H. V. Pedersen, Municipal Bldg., Marshalltown, Iowa.
(Joint meeting with)
**Iowa Sewage Works Assn.** Sec'y-Treas., Robert D. Mott, Iowa City, Iowa.

Oct. 13-15—AMARILLO, TEXAS. (Hotel Herring)
**Southwest Section A.W.W.A.** Sec'y-Treas., L. A. Jackson, Robinson Memorial Auditorium, Little Rock, Ark.

Nov. 3-5—ATLANTA, GA. (Biltmore Hotel)
**Southeastern Section A.W.W.A.** Sec'y, W. T. Linton, State Board of Health, Wade Hampton Office Bldg., Columbus, S. C.

Nov. 6-8—ATLANTIC CITY, N. J. (Hotel Claridge)
**New Jersey Section A.W.W.A.** Sec'y-Treas., C. B. Tygert, Box 178, Newark, N. J.
(Joint meeting with)
Nov. 6-8—ATLANTIC CITY, N. J. (Hotel Claridge)
**South Jersey Assn. Water Supts.** Sec'y, Walter Spencer, 2707 Bethel Ave., Merchantville, N. J.

Nov. 17-18—ROANOKE, VA. (Hotel not selected)
**Virginia Section A.W.W.A.** Sec'y-Treas., W. H. Shewbridge, 708 State Office Bldg., Richmond, Va.

Nov. 19-21—WASHINGTON, D. C. (Hotel not selected)
**Four States Section A.W.W.A.** Sec'y-Treas., W. A. Welch, 748 Public Ledger Bldg., Philadelphia, Pa.

Nov. 20—BOSTON, MASS. (Statler Hotel)
**New England Water Works Assn.** Sec'y, Jos. C. Knox, 609 Statler Bldg., Boston, Mass.

Dec. 10—WINTHROP, ME.
**Maine Water Utilities.** Sec'y, Earle A. Tarr, Winthrop, Me.

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B/W Controls have no floats —no vacuum tubes—no moving parts in the liquid. They are unaffected by pressures, temperatures, acids or caustics.

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# Here and There with Doc Symons

H.T.M.A.!—And here's a story I've been holding since I heard it one night last May at the A.W.W.A. Meeting in St. Louis. We (The Lindy "Omega" Harpers and I) were chinning with a couple of the Nuchar boys, John Harris and Art Welch, and Art steered the conversation to the subject of words and what they mean—Semantics, I think the professors call it.

To illustrate a point, Art told this story.—An Enterprising Business Man proposed to market activated carbon in packages for deodorizing refrigerators (where bananas and odors should never be). This E.B.M. desiring to increase interest in the product had pasted an advertising slogan on the package; a slogan sure to catch attention. It read simply—"Lasts Indefinitely."

Art remonstrated with the E.B.M., pointing out that semantically speaking the statement was incorrect and probably would not pass Federal Trade Regulations. "It is," said Art, "a flamboyant claim, and untrue."

"Not at all," said the E.B.M., "that just means that it's indefinite how long it will last!"

Wonderful thing—words!

* * *

*Help! Help!* Last March there came to our Chicago Office, a series of black line prints of charts. There was no letter, no article, and we did not see the envelope in which they came. The drawings were marked as follows: Fig. 1a,b.—Visentini's Method; Fig. 2—Flume; Fig. 3—Calibration of Curve of Rectangular Weir; Fig. 4—Calibration of Curve for Triangular Weir; Fig. 5—Theoretical and Actual Flow of Rectangular Weir; Fig. 6—Theoretical and Actual Flow of Triangular Weir. Help! Help! Does any one know what these are?

* * *

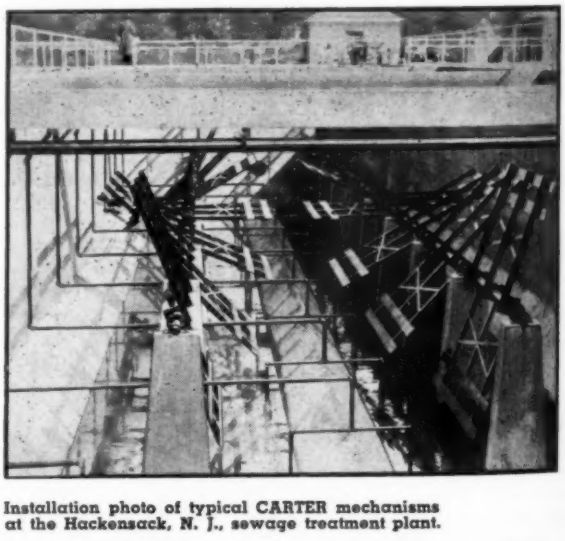
**I Like Conventions Because:** About a week after the N. E. W. W. A. meeting in Poland Spring, Me., Bill Cunningham, writer for the Boston Herald, attended a convention there and wrote about it as follows: "This classic address comes pretty close to being my favorite camping site. . . ." Having just spent a week there, I agreed and was happy to read Mr. Cunningham's comment and particularly the part which went, "I like conventions for a number of reasons, but one of the first is because you never know who you're going to encounter, and because you always get invited up to Room 173, which is where a few carefully selected guests have been invited to assemble afterwards, and where the conversation figures to be scintillating and the discussions usually quite lively. . . . I like conventions, too, because if you don't care whether you sleep or not, you generally learn something about life as it can be lived around 3 a. m. It generally consists of some wife who'd given up hope of getting her husband to bed and has left him to his own devices, sometimes even locking him out. Along about 3 a. m. he generally starts trying to do something about it. Here last night, some embattled brother was beating on a door at intervals


PADDLE

CARTER

AERATORS

*Write for Bulletin 4501*



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Mechanical mixing . . . one phase of water or sewage treating in which most engineers are in complete agreement. They know the added efficiency, the substantial dollar saving and the improved chemical mixing adds up to an effectual increase in overall plant results.

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with what sounded like a blackjack and roaring 'Helen, Helen. Wake up and let me in.' She must have been plenty sore at him for this went on for an hour. . . . As nearly as I could hear, she never did weaken. It could be that the guy had the wrong door. That's been known to happen.

"But I love conventions. . . . If it hadn't been for Mr. Helen I might have slept more, but those things are natural hazards at conventions."

I, too, love conventions, Mr. Cunningham, and if you had read my column after the A. W. W. A. Convention in St. Louis last spring, you'd have seen the same story of Mr. Helen—but in reverse.

* * *

From the *Safety News*—"The average worker at the age of 35 has approximately 17,000,000 more minutes to live. Every time he takes a chance to save a minute, he wagers all of the remaining minutes of his life. Are the odds worth it? When you gamble on safety, you bet your life." Oh, I know that not too many persons who read this column still have 17,000,000 minutes to live but it's still not worth it to gamble on safety.

* * *

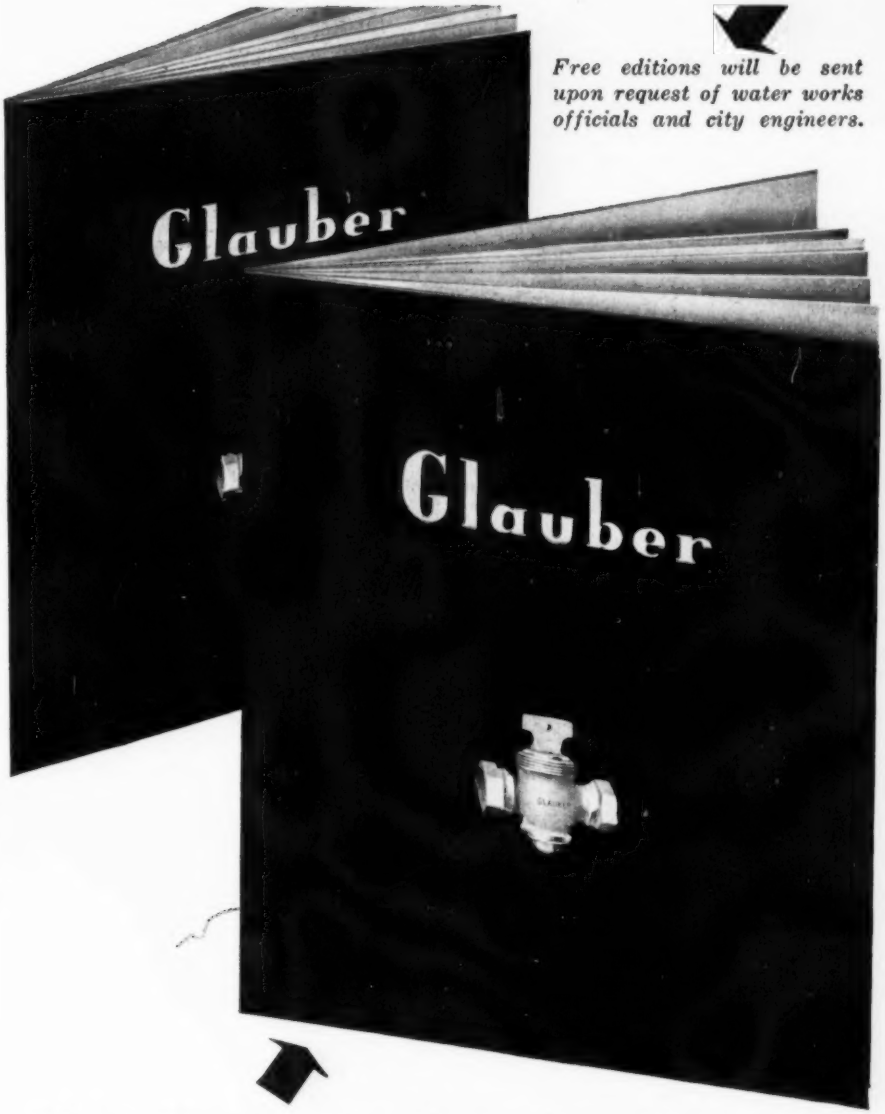
Some people have lots of time! In the December issue of *Fairbanks-Morse News* appeared an article titled, "To End All Coconuts" in which "An embarassed editor erects an econium to the deserving decipherers of a diophantine dilemma." (Whew!) The original story about five castaways on a Pacific Isle, and their coconuts appeared in the Aug. '46 issue of the F-M News. It was a puzzle and the editor asked for the simplest solution.

The number of men who worked out the solution to this problem was long and impressive and among those who correctly solved the puzzle were W. A. Hardenbergh, Editor *Public Works Magazine*, Ellsworth F. Filby, Kansas City, Mo., and of course that peerless puzzling puzzle man from Elizabeth, N. J., none other than Samuel F. (Sam II) Newkirk Jr. (P. S. That Ellsworth Filby turns out to be E. L.'s son.)

* * *

I don't know why I should mention Sam Newkirk so often when it is Mrs. Samuel F. Newkirk, Jr. who is the talented member of the family. Mrs. Newkirk is a flower arranger extraordinary. Witness the fact that she won third prize with


*Free editions will be sent upon request of water works officials and city engineers.*

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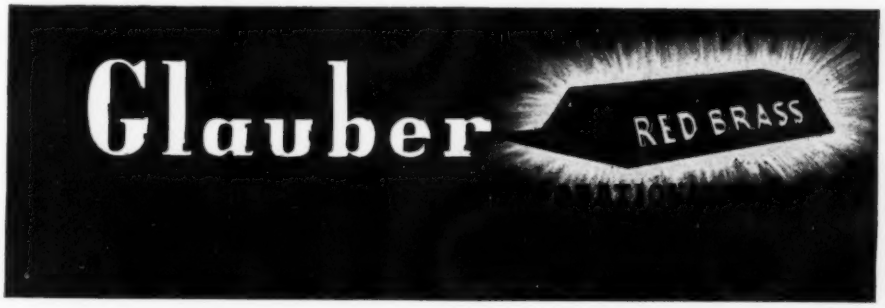

cut roses at the Philadelphia Flower Show, and four days later was awarded second prize for a bouquet of carnations at the International Flower Show in New York City. The charming lady is also a Certified Flower Show Judge. Go back to your puzzles and your "meter cephalalgia," Sam!

* * *

What's in a name? At a convention, not too many years ago, Harry Jordan was quite concerned about making proper provisions for the comfort of the mother of Ind. State Bd. of Health's Blucher Poole. Was Harry surprised when he discovered that "Mother" turned out to be Mrs. Blucher Poole, who is a mother, too —And a very charming one, I might add.

* * *

*Water Works Romance No.* 4—Or is this a sewage works romance?—George Martin, Supt. of the Green Bay, Wis. Metropolitan Sanitary District has known the Jack (Neenah-Menasha) Beatty's for a long time. In fact, George used to visit the Beatty's when Jack was in the Wis. State Dept. of Health in Madison.

Whenever George was in Madison, he dropped in at Jack's office. To get into that inner sanctum sanctorum it was necessary to pass through another office. Being of keen eyesight and normal wolf instincts, George never failed to notice a really cute number in that outer office. And so he asked Jack to fix him up with a date—blind that is, but Jack picked out the wrong girl and George had to try again on his next visit. That time he met Isabelle, and for the next two years the Beatty's had week end guests most of the time. When George went to Green Bay in 1933, Jack and his wife decided that Isabelle should go along, and so—Mr. and Mrs. George Martin.

* * *

*Personals Column*—H. B. of T.O.C. Expect answer soon—apologies due all, keep up good work. Signed XX Errata.

* * *

Years ago I looked forward to going to Poughkeepsie, N. Y. as a coxswain of the Univ. of Wis. Crew, but I transferred to Illinois and never got to Poughkeepsie until last month when there was a preliminary organizational meeting there of a local area sewage works operators' group. —Pardon the editorializing, for a moment, but I think these local groups are a great idea and they can be worked out within the framework of existing state organizations, if desired.

Anyway, while we were waiting for the baked, not half-broiled, chicken, Erwin W. Schrewe, Civil Engineer in Charge of Sanitation of the Area East of the Hudson River for the New York City Water Supply spoke up and said,—Quote—Doc, if you ever stop writing that column of yours, I'll cancel my subscription to the magazine. Unquote.

"That's my boy who said that!" And a happy June Teenth to You, too.

* * *

*Flash.* Stu Coburn Pays Off. Yessir! At the meeting of the Standard Methods Committee of the Federation in Toronto in Oct. '46, Stu Coburn of Metcalf and Eddy paid a


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Sparling Main-Line Meters have been giving Service and Satisfaction for over 27 years. They will serve you on pump, reservoir, treatment and distribution lines.

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BOSTON 8.....6 Beacon Street

debt of long standing; he bought a lunch for Gladys Swope (now of the Allegheny County Sanitary Authority).

It must be several years now since Stu incurred that debt at an A.C.S. meeting where the three of us had dinner together, and I have for some time been trying to get Stu to pay up—Imagine my surprise, and that of 17 other committee members, when Glad walked in—late—and Stu spoke up and said, "I'll buy your lunch Gladys."—Now all I have to ride Stu about is his failure to send me those stories he promised.

* * *

When I heard recently that S. P. (Si) Carman had resigned as City Engineer at Binghamton, N. Y. and is now a full-fledged consulting engineer, I was reminded of the story he told about the great Steinmetz. Steinmetz smoked a pipe and his bosses in those early days objected to smoking. Steinmetz said simply, "Gentlemen, No pipe—No Steinmetz!" The pipe stayed.

* * *

The famous Man-Miles Cup given at the Federation meeting to the Sewage Works Association whose aggregate man-miles of attendees is highest almost didn't go back last fall to the Central States Assn. where it has been since the idea started in Bill Orchard's fertile brain six years ago. Oh Yes, Central States won it again last October at Toronto (5th time) but the story is that when they brought the cup to Toronto it was left (by its momentary custodian) lying in a nondescript cardboard carton on the floor of the Hotel York lobby.

Only some hours later did a frantic member of CSSWA rush down to find where he had left it. Would have served them right if they'd lost it. I'm all for starting a new contest next year, a contest some one else can win, once in a while. And next summer after they have won the second cup for the third time, I say "Let's forget it."—Or maybe they won't win when the meeting is held in San Francisco.

* * *

Have you ever idly dreamed about how you would have made yourself if you had been your own architect. Here are some of the attributes with which I would have endowed one "Doc" Symons.

Bert Berry's Capacity for Work
Pete Wisely's or Lloyd Nelson's Sincerity


**About to Lay Bell & Spigot Water Lines?**

*Take a Look*

**Into the FUTURE**

How, for example, will some normal settling of the terrain affect the joining of those lines? And if, in the course of events, minor leaks develop, will they have to be dug up for repairs?

The answers to these questions can be "Not at all!" and "No!" — provided the lines are joined with

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Joined with this Thiokol plasticized compound, those lines will have ample flexibility to meet any normal settling — and to withstand far greater mechanical and thermal shock than they're likely ever to meet.

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*Tegul*-MINERALEAD has served for years in urban and suburban water lines all over the U. S. and in foreign countries. Its use needs no skilled labor, caulking or deep bell holes and it can be poured at sub-zero or tropical temperature.

Full information *now* may save you much in labor, time and dollars. Address our Mertztown Office, requesting Bulletin No. WB-4.

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Buffalo Bodie's Enjoyment of Life
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Jo Quinn's Gift of Friendly Gab.

The trouble with that idea is that if I had all of those things, I'd probably also have

Doc Symons' Big Head

* * *

Sorry Bodie—You'll Have to Wait. V.T.Y. Doc.


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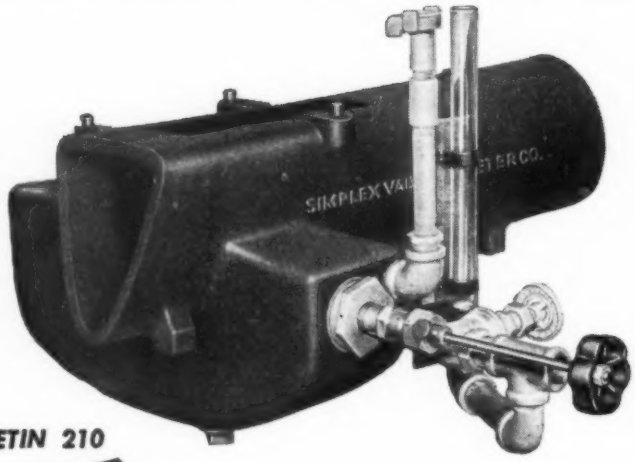

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## THE SPILLWAY

[Overflow from the main section]

### Ohio Water and Sewage Groups to Hold Contiguous Meetings

**Take a Leaf from Pennsylvania Practice and Approaching Meetings of National Water & Sewage Associations.**

The officers of the Ohio Section of A.W.W.A. and the Ohio Sewage Works Association have recently decided to begin the practice of holding their annual meetings contiguously in the same location in the future.

The meetings this year will be held September 30th-October 3rd inclusive, the Water Works group meeting the first three days and the Sewage Works group the last three days; thus on one day the two meetings will be in session the same day. The reason for the decision, as explained by the officers, is that a number of members engaged in both water and sewage activities will be able to take in both meetings with less expense and time required than has been the case when the water and sewage meetings have been held separately.

---

### Man vs. Microbe—the Race for Food

**[The Meaning of Sanitation as Seen by the Editor of *Food Industries Magazine*]**

"Sanitation is nothing more than a race between men and lower forms of life to determine who gets the food supply first. For man, bacteria, molds, insects and rodents all eat the same sort of food. If man loses the race, the food is spoiled and inedible. If man wins the race, he does it by keeping all lower forms of life from eating the food, and the technic of doing this is what is known as sanitation.

"If man permits a few of the lower forms of life, especially bacteria, to get a head-start (by poor sanitation), he handicaps himself so much that he may tie the race or lose it entirely. On the other hand, adequate sanitation handicaps the lower forms of life and helps man to win the competition."

# STRAIGHT FROM OUR READERS

## What They Tell Us and What They Ask About—

## CORROSION

"THE all-time headache in this business is corrosion. When you consider the millions of dollars invested in pipe, meters, etc., that are annually wasted away by it and the amount of water that is actually accounted for against the amount pumped, you can get an idea of what a cure for it would mean to the industry.

"We don't look to the manufacturers for much help because corrosion problems differ all over the country. It would be too much of a research and distributing job for a national meter manufacturer to study the individual problems, ascertain how much of the corrosion was due to galvanic, electrolytic, or bacterial action and then work out a preventive to be applied to the meters in each case. About the only improvement the meter manufacturers have made in the last ten years is to come out with an all bronze meter that weighs just about half of what the ordinary cast iron meter weighs.

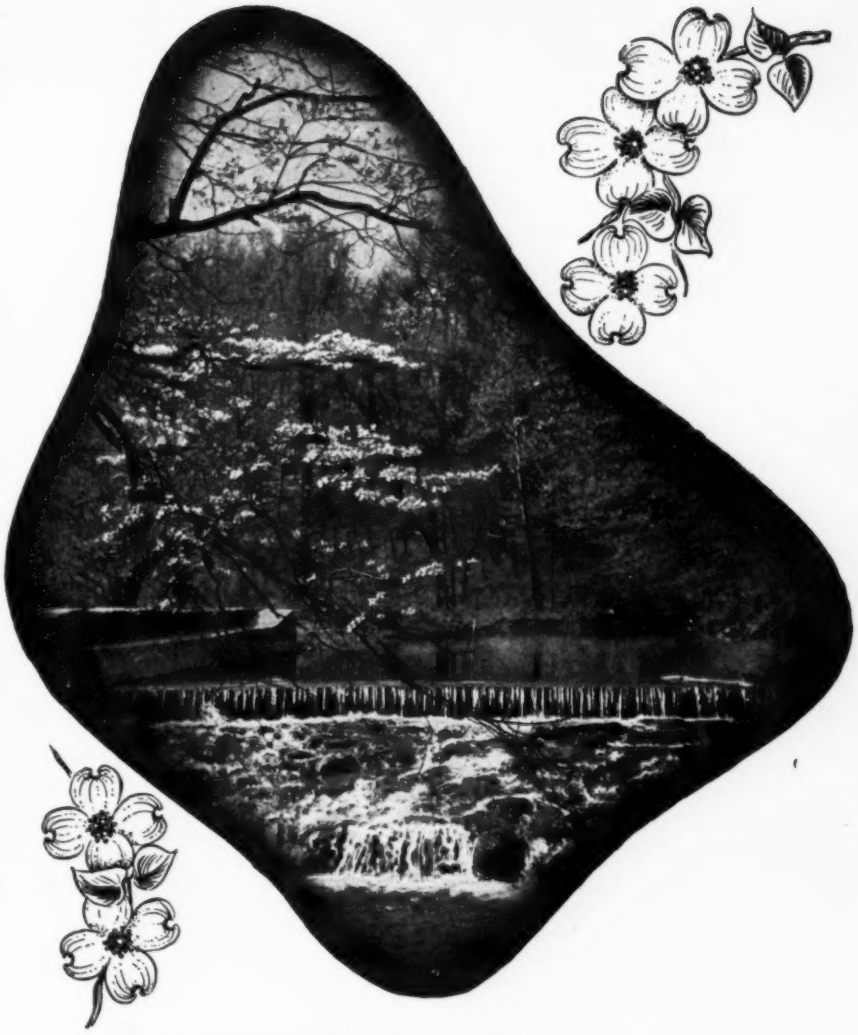
"I've been experimenting with an inhibitor that I've developed here in the shop. So far it works fine, but I won't divulge what it is until I'm sure it will work. That will be when I've tested it a year."

### *Water Mains—Cast Iron Pipe*

"Corrosion in cast iron pipe has been overcome to a great extent by cement and coal tar enamel linings. We use both here. I find the centrifugal cast pipe much better for the bituminous linings than the old pit cast pipe. It's much smoother and presents a much better surface for the adhesion of the lining. The pit cast is too porous and lining failures are usually due to the presence of moisture in the pores at the time the lining was applied."

* * *

"We are using cement and bitumastic lined pipe in nearly all of our work. Cast iron has been used in this field for over 80 years and we're familiar with it. We know just what it can do and where and how to install it. The bitumastic and cement linings have stopped the corrosion almost entirely."

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This spring would you like to obtain better color-removal? Then investigate the effect of activated silica sol as a coagulant aid.

N-Sol Processes of water coagulation are chosen because they shorten settling time, increase the capacity of filters, reduce the chemical costs, and also, improve the quality of the water produced . . . clear, sparkling water even when colors as high as 300 are encountered. In one water treatment plant, the color-removal was 85% to 90% before the use of the N-Sol Process, and after adoption the color-removal was stepped up to 95%.

Instead of a light, weak color floc, get a heavier, tougher floc and hence better color-removal with the N-Sol Process. Samples of N-Sol Process activated silica sols for jar tests are available on request.

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"I've seen some cast iron pipe that does a pretty good job against corrosion, too. We have some .... pipe in our lines and every time we dig a section of that up we find less tubercles in that than in any other cast iron pipe I've worked with. What they do with it, I don't know. It looks the same as any other cast iron pipe."

* * *

". . . We're sticking to cast iron for the most part. We know what it will do. It has proven its strength through years of service in the field. Its greatest liability, corrosion, has been overcome by the use of cement and bituminous linings. We use both of them and they do a swell job. We've been using cement lined cast iron in sizes up to 12 in. and bituminous lined in the sizes above that. Of course, you have to be careful in drilling them for connections, but even if a little does chip off, the amount of corrosion that will appear is just a drop in the bucket compared to what would happen in the entire length without the linings."

### *Plastic Pipe*

"We haven't used any plastic pipe as yet, but we do look forward to its possibilities in this field. The main feature is that it licks the corrosion problem. How it will behave in the ground remains to be seen."

* * *

"The makers of plastic pipe, for instance, will have to conclusively prove to us that it has the strength, non-corrosive ability, etc., to stand up in the applications we need it for before we can consider using it. They'll have to make it cheaper, too."

### *Copper Tubing*

"When copper tubing was no longer available, we were forced to use cast iron or galvanized pipe, and cement lined cast iron where corrosion exists."

### *Cathodic Protection*

"If someone hasn't perfected it already, a thought for the future would be the adaptation of the electrolytic method of protecting the interior or steel tanks from corrosion also to the pipes and well screens in the water business."

### *Water Meters*

"Our meters are standing up very well. Occasionally a telltale wire will break on a .... gauge from corrosion and have to be replaced. The manufacturers give us very good repair service on the meters."

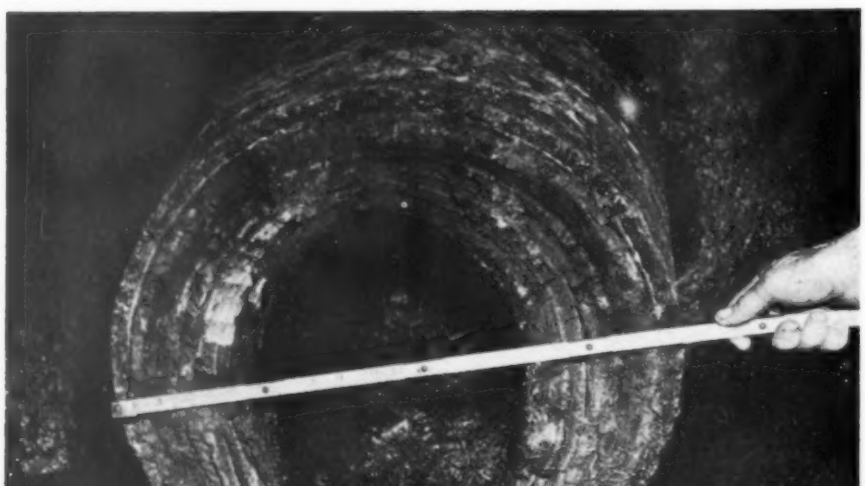
* * *

"As corrosion is an individual problem, we have been trying to lick the problem ourselves. We found one solution in applying a coating of vitreous enamel (same as on pots, pails, etc.) to the bases of the meters in our own shops. That cut down the corrosion to a great extent but we still got corrosive spots. We've had to give up experimenting when we couldn't get the enamel anymore. We tried other enamels and bituminous paints but the corrosion got them sooner or later and we have to look elsewhere for a solution."

### *Sewage Pump Stations*

"The excessive dampness in our pumping stations is causing us the greatest trouble at the present time. The whole pumping station is wet and all of the electrical equipment is affected. The switches for the pump are located in the sump pit and between the dampness and corrosion it causes they're out of order almost constantly. We tried a calcium chloride tray arrangement but there was just too much moisture for it to handle."


# CANCER?



Cancerous conditions of pipe lines wear down pumping equipment, boost electric bills, create fire hazards and aggravate consumers with red water or loosened deposits.

A water system in this condition is as low in efficiency as a cancerous human system. As the medical profession has been trying for years to find a cure for human cancer, so has the pipe cleaning industry been trying to find ways and means to clean pipe at a fraction of its initial cost.

**10 YEARS AGO —**

"Flexible" discovered a method that would remove even concrete from the interior without any possible injury to the pipe. Such conditions as shown in the above illustration were IMPOSSIBLE, but today a sizable amount of our work is of this nature. WRITE FOR ILLUSTRATED CIRCULAR TODAY.

**FLEXIBLE UNDERGROUND PIPE CLEANING CO.**

**9059 Venice Blvd., Los Angeles, California**

| | | | | |
|---|---|---|---|---|
| 855 Board of Trade Bldg. Chicago 4, Ill. | 401 Broadway New York 13 | 147 Hillside Ter. Irvington, N. J. | P. O. Box 165 Atlanta | 41 Greenway St. Hamden, Conn. |
| 1624 Harmon Place Minneapolis 3, Minn. | 29 Cordan Ave. Roslindale 31, Mass. | P. O. Box 694 Pittsburgh | P. O. Box 447 Lancaster, Texas | |

### *Sewage Gas Meters*

"Here's a routine cleaning job that I'd like to see eliminated some day. These .... gas meters record the flow of digester gas. Corrosion and carbon in the gas form on the movable parts and they get stuck. The carbon is by far the greater cause of the trouble. It forms on the small sensitive parts of the meter and we have quite a job getting it off. If we could get something to just stop the formation of carbon alone it would save us a tedious job."

### *Vacuum Sludge Filter*

"One of the big valves on a vacuum filter just went bad. When we took it down we found that the cast iron on one of the inside faces was all corroded. Looked as if all the iron was eaten away and only the carbon remained. You could scrape it off with your fingernail. A bronze valve is the best answer to the corrosion problem. We're working along on one filter now and I suppose we'll have to replace the cast iron valve on that one sooner or later. Corrosion is quite a problem in this plant. We originally had copper pipe in all the filtrate lines but they didn't stand up so well. We started replacing the lines with brass, but had trouble with that."

---

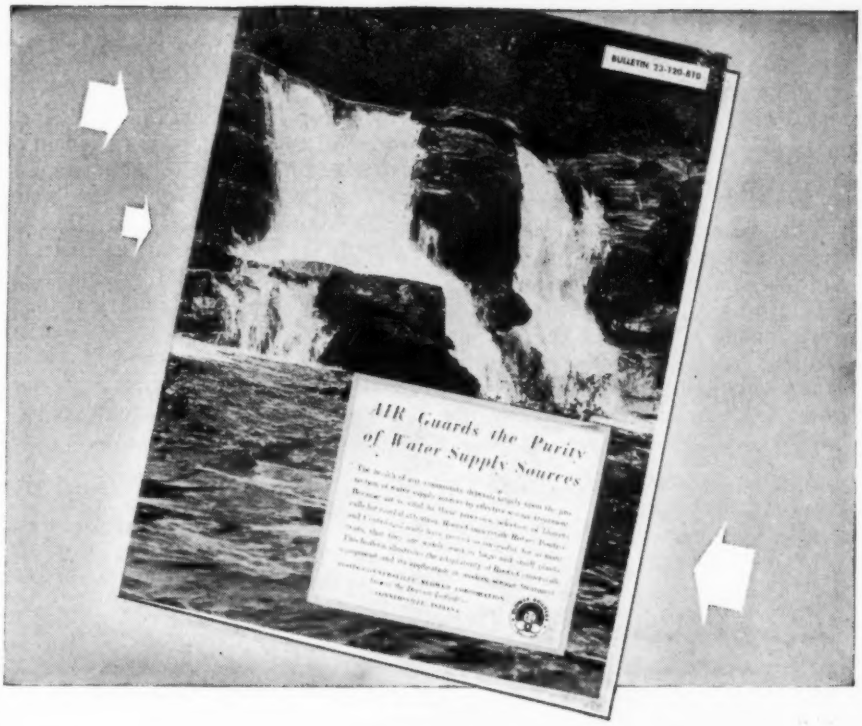
## Ford Studies River Pollution at Rouge Plant

The Water Laboratory of the Medical Dept. of the River Rouge plant of the Ford Motor Company has tackled the complex problem of stream pollution and plant waste disposal.

Keeping the waste materials out of the River Rouge is part of an international program to clean up the Detroit River and its tributaries, and it is hoped that with the modern laboratory available at the River Rouge plant the many and varied wastes may be removed from the disposal system. The Rouge plant has many waste items including sulphuric acid, ferrous sulphate pickling liquor, oil, paper mill waste, coke oven wastes, ore dusts, and sand and acids from a glass plant.

The future work of the laboratory, which has always been in control of drinking water and sewage treatment, will now include the recovery and treatment of waste products.

These forward steps taken by the Ford Motor Company are indicative of the attitude of industry in its responsibility towards stream pollution abatement.


HOW *R-C dual-ability* SOLVES BLOWER PROBLEMS FOR SEWAGE PLANTS

You'll be interested in the many applications of Roots-Connersville Blowers, illustrated in this new bulletin. It contains factual evidence of our *dual-ability* to design either Centrifugal or Rotary Positive units and shows how they match the needs of present-day sewage disposal plants, either large or small.

It indicates also how these units can be adapted to any modern drive — how they save first cost and operating cost. If you're planning new or enlarged facilities or replacements, you'll be helped by this new booklet. Ask for Bulletin No. 23-120-B10. It's free, of course.

**ROOTS-CONNERSVILLE BLOWER CORP.**

704 Mount Avenue, Connersville, Indiana

ROOTS-CONNERSVILLE ROTARY CENTRIFUGAL

BLOWER BUILDERS R-C SINCE 1854

BLOWERS · EXHAUSTERS · BOOSTERS · LIQUID AND VACUUM PUMPS · METERS · INERT GAS GENERATORS

★ ★ ONE OF THE DRESSER INDUSTRIES ★ ★

## Clay Pipe Engineering Manual

### A Book Review

The Clay Pipe Engineering Manual is an engineering reference and data book applicable to the design and construction of sanitary sewer systems, storm water drainage systems and to the drainage of sub-soil, roadways, airports, and railroads. Beginning with a chapter with a few words about clay pipe, the manual discusses such items as estimating future sanitary flows, hydraulics of sewer drains, sewer drain layouts, pipe strength and trench loads, pipe laying and construction of appurtenances, and designing municipal storm sewers and drains. Also included are specifications and standards of A.S.T.M., and specifications for clay filter block, as well as a chapter on vitrified clay liner plates, house sewer and drain connections, general drainage, roadway drainage, airport drainage, and railroad track drainage. The final chapter in the 160 page book contains tables and constants commonly used in connection with sewer systems.

The chapter on the hydraulics of sewers and drains contains valuable graphs for the solution of Kutter's Formula, the Hydraulic Properties of Circular Sections, and Discharge of Circular Pipes based on Manning's Formula. The chapter on Pipe Strength and Trench Loads contains a series of tables showing the loads on different size pipe, pounds per lineal foot caused by back-filling with various materials. The book also contains chapters showing the various types of standard strength vitrified pipe and fittings, with dimensions.

The Clay Pipe Engineering Manual is published by the Clay Sewer Pipe Assn., Inc., 1105 Huntington Bank Bldg., Columbus 15, Ohio, published in 1946. The book may be obtained for $3 per copy.


SYMBOL OF RELIABILITY

On a gate valve, the initials "RDW" do more than identify a great product; they inspire confidence—and when you deep-bury a mechanism like a gate valve, you need confidence.

R. D. Wood Gate Valves are simplicity to the *n*th degree, consisting of only 3 internal parts—a spreader and two discs, or gates. In opening, the spreader clears the gates of their seats; in closing, it presses from the center, putting them in position without distortion. Revolving freely on their trunnions as they move up and down, the gates are not subject to wear at any one place. Nothing to obstruct full flow. No pockets to collect sediment or scale.

Like their famed companion-product — Mathews Hydrants — these gate valves have proved themselves from 'way back under the most varied conditions, and often after long periods of idleness. Depend on an "RDW" for service when you need it most. Give your community the extra protection of R. D. Wood Gate Valves.

- High-strength cast iron, fully bronze mounted.
- Rigidly inspected, fully tested to 300 lbs. hydrostatic pressure.
- Conforming to A.W.W.A. specifications.
- Sizes from 2" to 30."

**R. D. WOOD COMPANY**

Public Ledger Bldg., Independence Square, Philadelphia 5, Pa.

Manufacturers of Mathews Hydrants and "Sand-Spun" Pipe (Centrifugally Cast in Sand Molds)


## Every Office Could Use One

"Mr. Smith, I hired him thinking maybe he could help me find that letter you asked me for last week."

## Vancouver, Wash., Advertises for Bids

The first stage of a sewer construction program involving a sewage treatment plant and storm sewers has been advertised for bids in Vancouver, Wash. The whole project will cost in excess of two million dollars. This is one of the largest undertakings in the northwest for many years.

Included in the first part of the project are four units consisting of three interceptors and an outfall sewer.

One of the interceptors is 21,150 lin. ft. of 10 to 42 inch sewer, including 70 manholes; the second unit consists of 11,780 lin. ft. of 15 to 30 inch sewer, including 29 manholes;

and the third unit consists of 11,110 lin. ft. of 21 to 27 inch sewer, including 34 manholes. The outfall sewer will consist of 1103 lin. ft. of 42 inch sewer and 305 lin. ft. of 30 inch sewer.

# MANUFACTURERS' and EQUIPMENT NEWS

## J. A. deCamp Heads National Water Main Cleaning Co.

**Frank Exec. V. P., Brown V. P. in Charge of Promotion**

The board of directors of the National Water Main Cleaning Company, New York, elected J. A. de Camp as president of the company to fill the vacancy caused by the death of Clinton Inglee.

Mr. deCamp has been connected with the company since 1914, when his father, with the late Mr. Inglee and Burt Hodgman, purchased control of the company from Oscar Muller.

J. Albert deCamp has been a director and officer of the company for many years and has been secretary and treasurer since 1941, and later vice president.

At this meeting J. A. Frank, who has been vice president and general manager, was made executive vice president of the company. James R. Brown, Chicago branch manager, was elected vice president in charge of sales promotion, thus increasing the scope of his activities to nationwide promotion.

## Unitair Compressors

The Sullivan Division of the Joy Manufacturing Co., Pittsburgh, has announced a complete new line of two-stage, air-cooled stationary air compressors. These "Unitair" compressors are available in nine sizes ranging from 15 to 100 hp., and displacements from 81 to 590 cfm. at 100 psi.

Three standard electric drives include built-in motor, direct connected motor and V-belt drive. These "Unitairs" may also be equipped for use with gasoline or diesel engines.

Further details may be obtained by writing for Bulletin GG-5A, Sullivan Division, Joy Manufacturing Co., Oliver Bldg., Pittsburgh 22, Pa.

## Electro Rust-Proofing Now Wholly Owned by W&T

**Dorr Co. Sells Interest**

Announcement has been made that the Dorr Co. has sold its interest in the Electro Rust-Proofing Corp. of Belleville, N. J., to Wallace & Tiernan Co. of Newark. The sale became effective Feb. 14.


# 11 miles...

MIRAFLORES—Canal Zone

GAMBOA—Canal Zone

## ...at a STRETCH

CLEANED BY NATIONAL

NATIONAL *Know How* PAYS

BEFORE

AFTER

Changes in pipe diameter, grades, bends and valves did not stop the National Water Main Cleaning Co. from cleaning eleven miles at a stretch in a line between Gamboa and Miraflores, Panama Canal Zone. The machine first traversed seventeen thousand feet of 30" pipe; opened automatically to clean the next nineteen thousand feet of 36" pipe, passing through 30" gate valves enroute; and then, without slackening speed, passed into a 30" line and cleaned another twenty-one thousand feet. Thus, the entire fifty-eight thousand feet were cleaned with but a single entry. The machine's operation was controlled by telephone and two-way radio. There was no interruption in service and the longest shut-off was eleven hours.

The technical skill and experience that enable National to perform this feat will enable us to clean your mains more effectively, with fewer pipe openings, in less time.

**THE NATIONAL WATER MAIN CLEANING CO.**

50 CHURCH STREET, NEW YORK 7, N. Y.

ATLANTA 3, 1221 Mortgage Guarantee Bldg.
BOSTON 15, 115 Peterboro St.
CHICAGO 6, 205 W. Wacker Dr.
KANSAS CITY 2, 3707 Madison St.
MEMPHIS 3, 519 Farnsworth Bldg.
MONTREAL 2, 2028 Union Ave.
OMAHA 5, 3812 Castellar St.
RICHMOND 19, VA., 210 E. Franklin St.
ST. LOUIS 17, 7103 Dale Ave.
SAN FRANCISCO 5, 501 Howard St.
WACO, TEXAS, The Rohan Co., Inc., P. O. Box 587
WINNIPEG, 576 Wall St.
MAYAQUEZ, P. R., Americo Rodriquez, Inc., P. O. Box 749

## Diamond Alkali Completes Chicago Warehouse

Diamond Alkali Co. has completed a specially designed warehouse for its Benner Chemical Sales Division in the Chicago area. The warehouse is designed to provide for economical storage and handling of various products such as soda ash, caustic soda, cylinder chlorine, alkali specialties, etc.

Four railroad cars can be spotted on the totally enclosed railroad track in the center of the building, permitting unloading from both sides of cars and quick access across a storage floor to inventory or to waiting trucks. All bags, drums, etc., will be handled by modern mechanical methods.

## Cortright Gen. Sales Mgr. Clayton Mfg.

### Company Moves to New Plant at El Monte

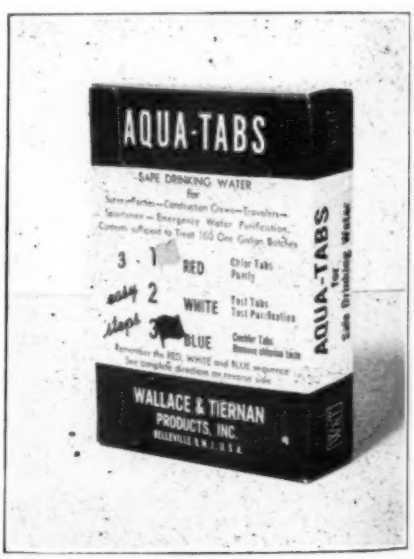
The Clayton Manufacturing Co., El Monte, California, announced the appointment of J. A. Cortright as general sales manager, succeeding L. F. Working, retired.

Mr. Cortright, who joined the company in 1935 as field representative, has been sales manager of the Kerrick Kleaner division since 1941. His promotion places him in charge of sales, advertising and field service for the complete Clayton line, including Kerrick Kleaners and cleaning compounds, Kerrick Hydro-steam Kleaner, Clayton engine and chassis dynamometers, Clayton Steam Generators and other allied equipment and products.

Coincident with the announcement of Cortright's appointment the company announced its move into a new and modern twenty-acre plant in El Monte.

## Vest Pocket Kit for Purifying Drinking Water

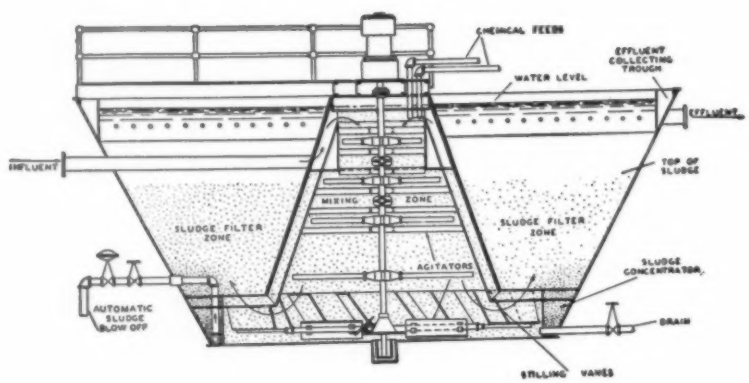
**Aqua-Tabs** is the new water purifying kit produced by Wallace & Tiernan to point out that sportsmen, travelers, and others away from approved public water supplies no longer need to take chances with drinking water quality.




The *Aqua-Tabs* kit is an adaptation of a wartime development to supply pure water to troops in combat. It employs the same principle of purification used in municipal water plants, namely, chlorination. This pocket size kit includes a hypochlorite, orthotolodine, and a dechlorinating agent.

The kit contains a sufficient number of tablets to treat 100 gallons of water, and these Aqua-Tabs will be marketed by Wallace & Tiernan of Belleville, N. J., through sporting goods dealers.


# A new, more efficient means for removing impurities from municipal water supplies




**PERMUTIT *(SPAULDING)* PRECIPITATOR**

N the Spaulding Precipitator, Permutit* has combined precipitation and separation in a single treatment step, so that water being treated flows clear from the top of the equipment.

The Vertical Precipitator, as shown schematically above, was the first development of this "sludge blanket" principle, which provides a sharp demarcation between sludge and clear effluent. Other designs are available.

Permutit Precipitators not only represent a more efficient means of cold lime treatment, but are more compact than older style methods. Permutit will be glad to cooperate with you and your consultants on any problem of producing a clear, soft, iron-free water. Many types of equipment are available, and more than 30 years' experience is at your service.

For full particulars write to The Permutit Company, Dept. W-4, 330 West 42nd Street, New York 18, N. Y., or Permutit Co. of Canada, Ltd., Montreal.

*Trademark Reg. U. S. Pat. Off.

# PERMUTIT

WATER CONDITIONING HEADQUARTERS

## Tubular Micrometers

The new Tumico micrometers, manufactured by the Tubular Micrometer Co. of St. James, Minn., are

Typical Set of Tumico Micrometers (Sizes 0 to 6 inches)

unlike the conventional solid frame micrometers. These have hollow or tubular frames, thereby cutting the structural weight up to 50 per cent.

Further information on these new micrometers may be obtained from the Tubular Micrometer Co., St. James, Minn.

## Concerning the G-H Shock-Proof Service Box

**(A Correction)**

In the December 1946 and February 1947 issues of this magazine there appeared an announcement concerning the new G-H Shock-Proof Curb Service Box which is being manufactured and sold by Pilot Engineering Service, 3804 N. Fratney St., Milwaukee, Wis. This announcement was prepared by us from information given in a leaflet distributed by Pilot Engineering Service.

We have since been advised that we were in error when crediting Pilot Engineering Service with the development of the novel G-H Curb Service Box. Now we learn that the initials "G-H" stand for Clarence Greutzmacher, Engr. of Distribution, and Otto Halvorson, Asst. Mechanical Engr. of the Milwaukee Water Dept., who jointly developed this novel shock-proof rubber ring gasketted telescopic fiber curb box on which applications for patents have been filed.

We are very glad to print this correction in order that inventors Greutzmacher and Halvorson receive full credit for their invention of this light-weight corrosion and shock-proof telescopic curb service box.

## L. H. Sperry Retires at Hercules Powder

Luke H. Sperry, a member of the board of directors and director of engineering for the Hercules Powder Co., retired on December 31st.

To replace Mr. Sperry the company has appointed Ernest S. Wilson, formerly chief engineer, to become Director of the Engineering Department. Ray N. Wheelock will become assistant director.

All three men have been in the explosives industry for a number of years and associated with the Hercules Powder Co. for most of their industrial experience.

## Liquid Conditioning Corp. Moves Offices

The Liquid Conditioning Corp., manufacturers of Liquon Processes and Equipment for softening and clarification of water and other liquids, has removed its main office and plant to Linden, N. J. The location is at 114 East Price St., Linden, N. J.

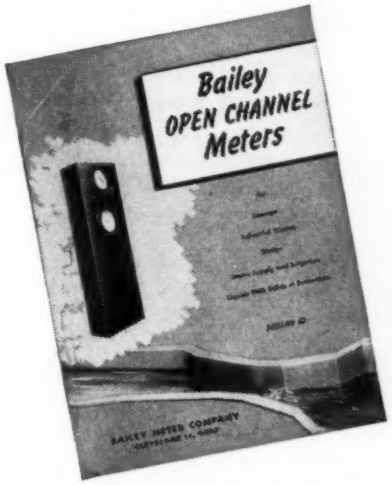

*For trouble-free, low cost measurement of—*

**SEWAGE**
**INDUSTRIAL WASTES**
**SLUDGE**
**IRRIGATION WATER**

# BAILEY

## OPEN CHANNEL METERS

*Offer These Advantages:*




1. Easy to Install
2. Retain Accuracy
3. Self-Cleaning
4. Adjustable Capacities
5. Totalize Multiple Flows
6. Chemical Feed Control
7. Flow and Ratio Controls

*Ask for Bulletin 62*

MU22

**BAILEY METER COMPANY**

1072 IVANHOE ROAD • CLEVELAND 10, OHIO

*METERS and CONTROLS for SEWAGE and WATER*

VENTURI TUBES, FLUMES, WEIRS, NOZZLES, ORIFICES • DIRECT MECHANICAL AND REMOTELY LOCATED REGISTERS • AIR-OPERATED, ELECTRONIC AND ELECTRIC CONTROLS.

## Silica Removal Units

The Liquid Conditioning Corp. of Linden, N. J., has announced the development of equipment for the removal of silica from raw boiler feed water. This new Liquon development employs a standard demineralizing plant, consisting of a Liquon hydrogen zeolite unit followed by an anion exchange unit. To effect the elimination of silica, a fluoride is added to the raw water entering the hydrogen zeolite unit. The fluoride is converted into hydrofluoric acid by a resin type of acid-regenerated cation exchange material known as Liquonex CR. The hydrofluoric acid combines with the silica to form fluorosilicic acid and the Liquonex CR converts the raw water hardness into the acids corresponding to the salts which are present.

In the second stage Liquon anion exchange unit, the fluorosilicic acid, together with the acids formed from the hardness, are removed by Liquonex A, an alkali-regenerated anion exchange resin. This process removes both silica and hardness from the water.

In a modified process the silica is removed without the addition of fluorides by means of a special anion exchanger following the standard process for demineralizing.

Complete information on these new developments in water conditioning may be obtained from Liquid Conditioning Corp., 114 East Price St., Linden, N. J.

## Fraley Board Member Diamond Alkali

Fred W. Fraley, Vice President in Charge of Sales of the Diamond Alkali Company, was elected a director of the company recently.

Mr. Fraley joined the company in 1928 as a salesman in the Houston area, after graduating in chemical engineering from The Rice Institute. He has been associated with the Pittsburgh headquarters since 1932.

Mr. Fraley is a director of the Chlorine Institute, Inc., a director of the U. S. Alkali Export Association, a member of The Chemists' Club, and other organizations.

## W. F. Rockwell, Jr. Named Pres. of Rockwell Mfg. Co.

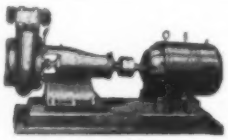
At the recent annual meeting of the Rockwell Manufacturing Co., Pittsburgh, the board of directors elected W. F. Rockwell, Jr., as President. Mr. Rockwell was formerly Vice Pres. and General Manager.

Col. Willard F. Rockwell, who has been both President and Board Chairman, will retain the office of Chairman of the Board. All other officers were re-elected.

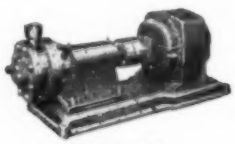

**Plan *with* Peerless!**

**PEERLESS Centrifugal Pumps** *(formerly Dayton-Dowd)*

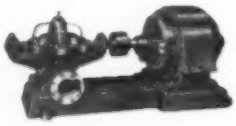
MEET extensive, continuous-duty pumping requirements in all Industries and Municipalities desiring advanced pump design, reduced operating cost and high pump efficiency.



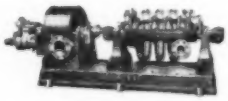
**Type DS**
***CENTRIFUGAL PUMPS***
For Chemical, Oil, Food Processing, etc. Capacities: Up to 600 G. P. M. Heads to 230 ft.



**Type XT**
***TURBINE (Vane) PUMPS***
For Butane-Propane, General & Process Work. Capacities: Up to 150 G. P. M. For high heads.



**Type A**
***CENTRIFUGAL PUMPS***
For General Services-Maximum efficiencies. Capacities: Up to 60,000 G. P. M. Sizes: 2" to 42".



**Type B**
***BOILER FEED PUMPS***
For High Pressures in Refinery, Pipe Line & Boiler Feed Services. Pressures up to 700 lbs.

**Type AF**
***FIRE PUMPS*** (*formerly Dayton-Dowd*)
Underwriters Approved. Capacities: 500 to 2000 G. P. M. One of a Variety of Peerless Fire Pumps.

Peerless Pump Division manufactures an extensive line of high quality centrifugal pumps for usual or unusual pumping applications. The Peerless staff of highly trained engineers or field representatives will gladly assist you in prescribing the proper pump for your specific application. If you are considering a pump installation demanding long range, trouble-free service, then Plan With Peerless – It will pay!

**PEERLESS PUMP DIVISION**
*FOOD MACHINERY CORPORATION*

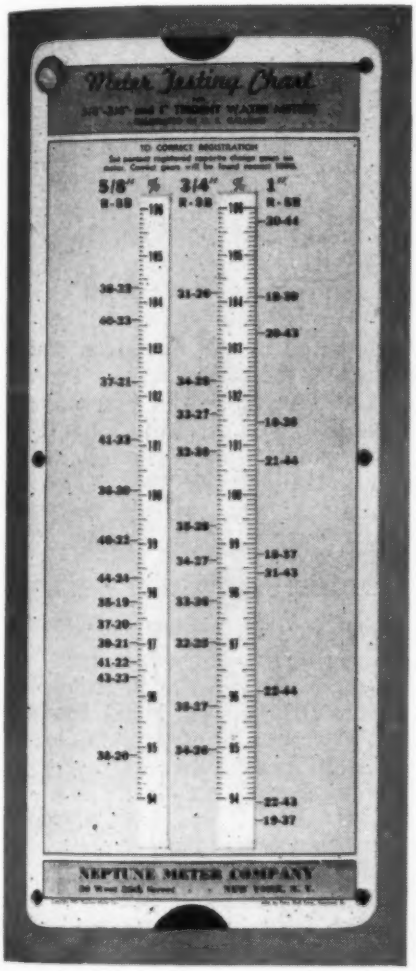
Factories: 301 W. Avenue 26, Los Angeles 31, California; Quincy, Illinois; Canton 6, Ohio
District Offices: Canton 2, Ohio; Ardmore, Pennsylvania; Decatur, Georgia; Dallas, Texas
*Distributors in Principal Cities*

## L. S. Luther to Represent Liquon

The Liquid Conditioning Corp. of Linden, N. J., has announced the appointment of L. S. Luther & Co. as engineering sales and service representatives in the District of Columbia, most of Virginia, and most of Maryland.

The L. S. Luther Co. headquarters are at 1018 18th St., N. W., Washington 6, D. C.

## Meter Testing Chart




The Neptune Meter Co. of New York has produced a unique slide rule type of testing chart for 5/8, 3/4 and 1 in. Trident water meters. Calibrated in U. S. gallons, this device makes it possible to correct registration of meters. To do so, the per cent registered on any particular meter is set on the slide opposite the change gears in the meter. The correct gears will be found nearest the 100 per cent value.

This "Meter Testing Chart" may be obtained from the Neptune Meter Co., 50 West 50th St., New York, N. Y.

## Carter Crosshead Guide

The Ralph B. Carter Co. of Hackensack has announced a new Crosshead Guide for their plunger sludge pump. This Crosshead Guide gives the plunger traveling in the pump cylinder a guided motion which prevents misalignment or sidewise motion. The guide rod travels vertically up and down with the plunger through bronze guide bearings. With this change in design of pump, the tendency to eccentric motion in the vertical path of the plunger is eliminated and excessive packing wear is reduced to a minimum. Adequate lubrication of the crosshead guide is provided by a sight feed oiler.

Further information on this new design of the Carter sludge pump may be obtained from the Ralph B. Carter Co., 192 Atlantic St., Hackensack, N. J.

## Side Suction Centrifugal Pumps

The Deming Co. of Salem, Ohio, has announced a new line of standardized side suction centrifugal pumps to meet a wide scope of pumping requirements in diversified industries. These pumps, made in three types, single ball bearing with open type impeller, two ball bearing with

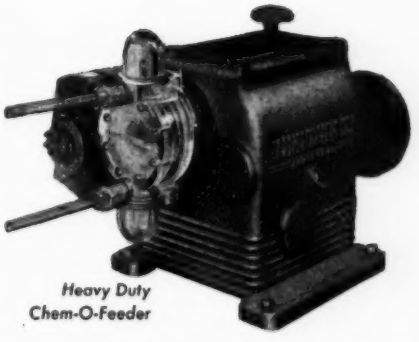
GET

% PROPORTIONEERS %

CHEM-O-FEEDER

The discovery of harmful organisms and disease germs in your water supply is something to get excited about . . . destroy them by hypochlorination with %Proportioneers% Heavy Duty Chem-O-Feeder — the modern way to protect the health of your community. There's no risk of dangerous undertreatment or the disagreeable taste resulting from wasteful overtreatment. By simply turning a knob, the chemical feeding rate may be instantly adjusted while the pump is operating . . . up to 7 g.p.h. can be fed with extreme precision.

Sterilization of water supplies becomes entirely automatic with the Chem-O-Feeder cross-connected to the starting switch of the main pump motor. No skilled help is required as there is none of the danger that goes with using deadly chlorine gas. The chemical being fed shows plainly in the "See-Thru" plastic head and the action of the check valves and diaphragms is clearly visible. In addition to handling hypochlorite solution, the Heavy Duty Chem-O-Feeder successfully feeds all other water treating chemicals — soda ash, lime slurry, aqua ammonia, activated carbon, sulphates, ferric chloride, polyphosphates, etc.



*Heavy Duty Chem-O-Feeder*

For help with your chemical feeding problems write %Proportioneers, Inc.%.

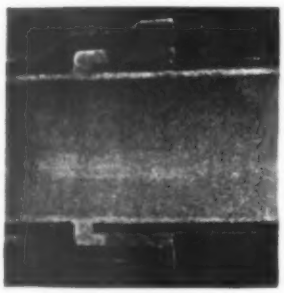
*Ask for Bulletin SAN-2.*

% PROPORTIONEERS, INC. %

9N CODDING STREET • PROVIDENCE 1, R. I.

The TATE Cement Lining Process
Restores efficiency of old Water Mains

*Now* is the time to investigate the Tate Cement Lining process —and see what it can do to restore the efficiency of your old water mains.



View showing Tate Process in Pipe Joint. Note thoroughness of Lining.

*Write for Literature.*

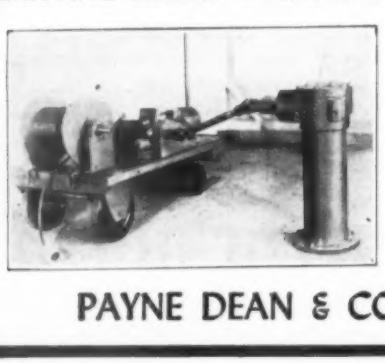
**What the TATE Process accomplishes**

1. Water mains cleaned and cement-lined without removing pipe.
2. Eliminates discoloration and further cleaning costs.
3. Reduces pumping costs.
4. Restores reduction in head and flow co-efficients. This means full fire protection and lowered insurance rates.
5. All joints cement-lined . . . just one continuous pipe.
6. Does the job without interruption of service to consumer.

TATE PIPE LININGS, Inc.
ANDOVER, MASS.

PAYNE DEAN GATE OPERATOR

ONLY TWO MEN TO OPERATE YOUR LARGEST GATES. CUTS OPERATING TIME 80% -- NO BREAKAGE OF PARTS -- FITS ONTO YOUR EXISTING TRUCK -- FOR OPERATING GATES FROM 12" TO 60".



PORTABLE MOTOR OR GASOLINE OPERATOR FOR FLOOR STAND OPERATED SLUICE GATES AND UNDERGROUND GATES.

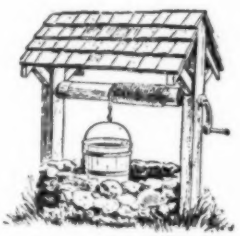
PAYNE DEAN & CO., MADISON, CONN.


open type impeller, and two ball bearing with semi-enclosed impeller, may be obtained in sizes from ½ in. to 2 in. side suction, with capacities from 2 to 200 gallons per minute.

Further information on these pumps may be obtained from Bulletin 3900-B of the Deming Co., Salem, Ohio.

## "Meet Us at the Well!"

The following members of the Water and Sewage Works Manufacturers' Assn. have reserved exhibit space at the forthcoming Annual



*"Meet me at the Well"*

Convention of the **American Water Works Association** and the **Federation of Sewage Works Associations**, to be held concurrently in the Civic Auditorium, San Francisco, California, July 21-25, 1947. These 95 exhibitors who will occupy 152 booths wish to say to one and all—

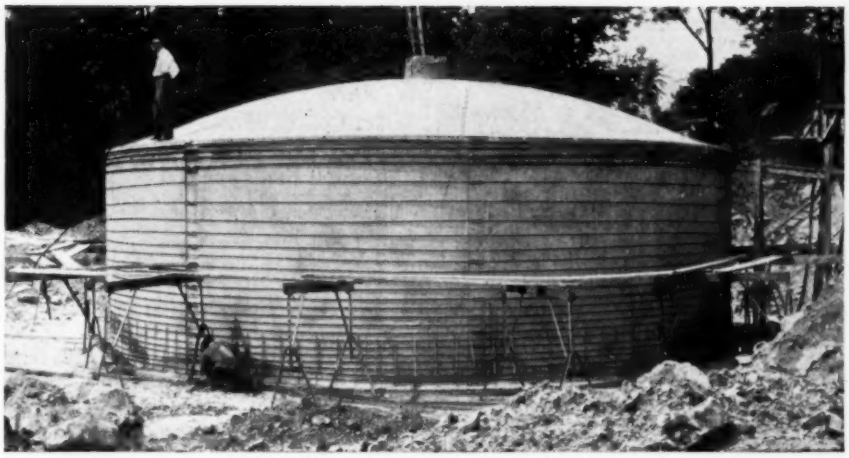
"MEET US AT THE WELL"*

American Cast Iron Pipe Co.
*American City Magazine, The*
American Pipe & Construction Co.
Armco Drainage & Metal Products
Art Concrete Works
Atlas Mineral Products Co.
Badger Meter Mfg. Co.
Barrett Division, (Allied Chemical & Dye Corp.)
Buffalo Meter Co.
Builders-Providence, Inc.
Calgon, Inc.
Carter Co., Ralph B.
Central Foundry Co.
Centriline Corporation
Chain Belt Co.
Chapman Valve Mfg. Co.
Chicago Bridge & Iron Co.
Chicago Pump Co.
Clayton Manufacturing Co.
Cloroben Corporation
Clow & Sons Co., James B.
Culligan-Zeolite Co.
Dearborn Chemical Co.
De Laval Steam Turbine Co.

*Slogan for the San Francisco Convention. A replica of an old farm well with a real "Old Oaken Bucket," held by the California Section and denoting the largest A.W.W.A. Section, is to be set up as the center motif of the W. & S. Wks. Ass'n's concurrent conventions.

Dorr Company, Inc., The
Dresser Manufacturing Div. (Dresser Industries)
Electronic Purification Corp.
*Engineering News-Record*
Fisher Research Laboratory
Flexible Sewer Rod Equip. Co.
Ford Meter Box Co.
Forni, George P.
General Electric Company
Gilmore Steel & Supply Co.
Greenberg's Sons, M.
Grove Regulator Co.
Hanks Co., The Fred W.
Hardinge Co.
Hays Manufacturing Co.
Hersey Manufacturing Co.
Homelite Corporation
Hydraulic Development Corp.
Industrial Chemical Sales Div. (West Virginia Pulp & Paper Co.)
Inertol Co.
Infilco Incorporated
Jeffrey Manufacturing Co.
Johns-Manville
Jones Co., James
Lakeside Engineering Corp.
Lead Industries Association
Leadite Company
Link-Belt Co.
Lock Joint Pipe Co.
Lohman Brothers—Valves
Ludlow Valve Mfg. Co.
McWane Cast Iron Pipe Co.
M & H Valve & Fittings Co.
Mathieson Alkali Works
Mueller Co.
National Water Main Cleaning Co.
Neptune Meter Co.
Northrop & Company
Omega Machine Co.
Pacific Flush-Tank Co.
Pacific States Cast Iron Pipe Co.
Pelton Water Wheel Co.
Permutit Company
Pitometer Co., Inc.
Pittsburgh-Des Moines Steel Co.
Pittsburgh Equitable Meter Div. (Rockwell Manufacturing Co.)
Pittsburgh Pipe Cleaner Co.
% Proportioneers, Inc. %
*Public Works Magazine*
*Public Works News*
Rensselaer Valve Co.
Rich Manufacturing Co.
Rusta Restor Div. (The Johnston & Jennings Co.)
*Sewage Works Engineering*
Simplex Valve & Meter Co.
Smith Mfg. Co., The A. P.
Smith-Blair, Inc.
Smith Co., S. Morgan
Sparling, R. W.
Thomson Meter Corp.
United States Pipe & Fdy. Co.
Vapor Recovery Systems Co.
Wailes Dove-Hermiston Corp.
Walker Process Equipment
Wallace & Tiernan Co.

(*Continued on p.* 104)

• PRE-STRESSED "GUNITE" •

The picture shows a partially completed 40' diameter, 110,000 gallon pre-stressed "GUNITE" tank with a "GUNITE" dome roof, designed and built by us.

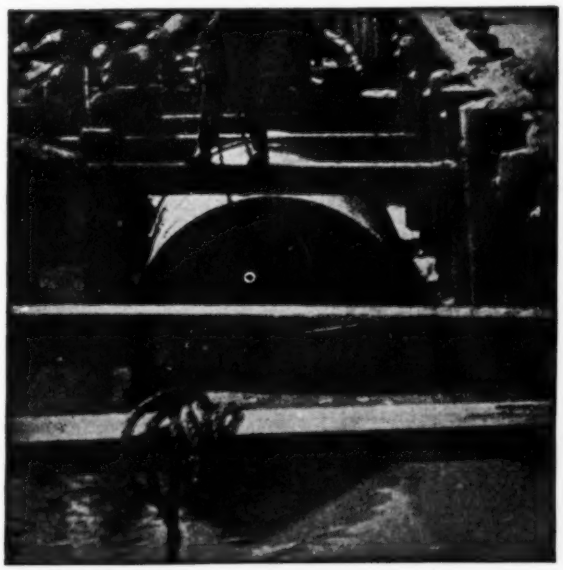
When this photo was made the tank was filled with water for leakage test. After the test showed the tank to be bottle-tight, two inch mesh reinforced "GUNITE" was placed over the outside to permanently protect the pre-stressed hoop rods. The tank was subsequently covered with earth, with 12" of fill over the dome.

This photo illustrates our method of pre-stressing the hoop rods by means of several turnbuckles in each hoop.

Our Bulletin C2300 describes and illustrates prestressed "GUNITE" construction in detail and also scores of other uses of "GUNITE."

Write today for your free copy of Buletin C2300.

CEMENT GUN COMPANY
"GUNITE" CONTRACTORS
GENERAL OFFICES—ALLENTOWN, PENNA., U.S.A.



84" pipe—Spring Lake, N. J.

FLANGED PIPE
FLEXIBLE JOINT PIPE
BELL & SPIGOT PIPE
SPECIAL CASTINGS
SHORT BODY BELL & SPIGOT SPECIALS

*Large stock enables us to make prompt shipments.*

CAST IRON PIPE

SIZES 2" TO 84"

Warren Foundry & Pipe Corp.
11 Broadway, New York

Warren Pipe Company of Mass., Inc.

L&S

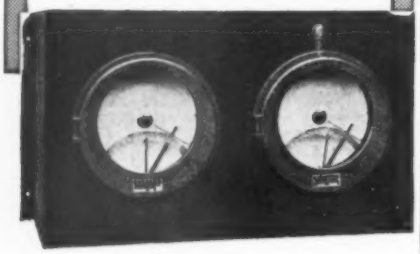
**STEVENS**

*Type B*

**RECORDER**

*...does 3 jobs well*

- *Records and indicates head or flow.*
- *Totalizes flow.*



The user list of Stevens *Type B* Recorder reads like a Blue Book. Reason—the instrument is particularly adapted to waterworks, sewerage and industrial applications—and is equally suitable to any class of recorder service.

*Type B* is really *triplets.* It records and indicates either head or rate of flow and registers total volume passed in any elapsed time.

Circular charts are used and may be had for daily or weekly operation.

The *Type B* is direct float operated or remotely controlled. Quality 8-day or electric clock is standard equipment. The recorder can be mounted on wall, pedestal, panel, or in sewer manhole. It can be hermetically sealed against corrosive fumes.

Want more information about this 3-way wonder? Write for Bulletin 25.

**LEUPOLD & STEVENS INSTRUMENTS**

Manufacturers since 1907

**PORTLAND 13, OREGON**

*Hydrographic • Surveying • Navigation*
*Automatic Controls*

Leupold & Stevens Instruments
4445 N. E. Glisan St., Portland 13, Oregon

Please send Bulletin No. 25 on the Stevens *Type* B Recorder.

*Name* _____

*Organization* _____

*Title* _____

*Street* _____

*City* _____ *Zone* _____ *State* _____

*Water & Sewage Works*
*Water Works Engineering*
*Western City Magazine*
Western Steel & Pipe Co.
Wood Co., R. D.
Worthington-Gamon Meter Co.
Yeomans Brothers Co.

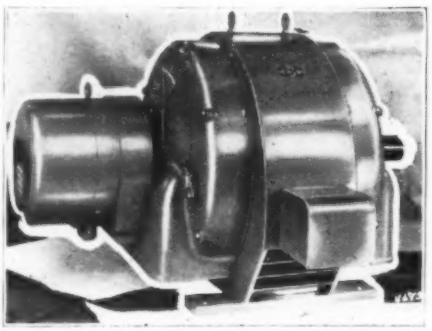
## Hendrick Appoints New Sales Representatives

An announcement from the Hendrick Manufacturing Co. of Carbondale, Pa., has been made of the appointment of three new sales representatives.

A. H. Patten, head of Patten Engineering Co., Denver, will cover Colorado, Utah, Wyoming, Montana and southern Idaho; Fred G. Greaves Co. of Seattle will handle Washington, Oregon and northern Idaho; and Orville B. Ackerly, Jr., San Francisco, will cover northern California and the Reno section of Nevada.

The Hendrick Manufacturing Co. fabricates perforated metal and screens.

## Heavy Duty Synchronous Motors



The Electric Machinery Mfg. Co. of Minneapolis, Minn., has announced a newly available "Heavy-Duty" Synchronous Motor for constant speed drives up to 1000 hp. These heavy duty synchronous motors are splash-proof and can be used in various industrial mills and for pumping jobs in water and sewage works.

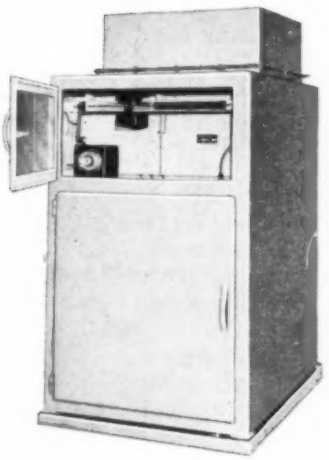
**WHAT'S YOUR FEEDING PROBLEM?**

**OMEGA**

**CHEMICAL FEEDERS**

A whale of a lot of chemical feeding problems have been solved with OMEGA "Loss-in-Weight" Gravimetric Feeders — the most accurate type of dry chemical feeders made. Feeding rate is instantly adjustable by dial over a 100 to 1 range, accurate to within 1% of rate set. Operation is fully automatic, with alarms to warn of over or under feeding. Automatic proportional control devices and OMEGA Dust Removers are easily installed.

*Write for bulletin.*



OMEGA "Loss-in-Weight" Gravimetric FEEDER handles any dry material, including Ferrisul.

**OMEGA PRODUCTS**

Volumetric Feeders • Gravimetric Feeders
Solution Feeders • Lime Slaking Equipment
Bucket Elevators • Laboratory Stirrers

**OMEGA MACHINE CO.**
(Division of Builders Iron Foundry)
10 CODDING ST., PROVIDENCE 1, R. I.

CHEMCO
Equipment
FOR
EVERY CHLORINATION
AND
WATER CONDITIONING
PROBLEM

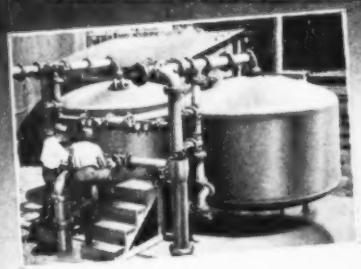
For Your
SEWAGE PLANT

CHEMCO CHLORINATORS are available for every type of installation. The above shows two CHEMCO 100# capacity chlorinator installed for the State of New York. Note use of Aqua-Thermal Coils.

For Your
SWIMMING
POOL

CHEMCO has "Everything for the Swimming Pool" from the Filters to the Life Preservers.

For Your
WATER WORKS



A large Chemco-Filter Plant installation for the Santa Fe Railroad, Winslow, Arizona. Consult CHEMCO first for your Chlorinator or Water Conditioning Problem.

CHEMICAL EQUIPMENT CO.
1700 NO. MAIN STREET
P. O. Box 3098 Terminal Annex
Los Angeles 54, Calif.
MIDWEST FACTORY BRANCH
211 W. Wacker Drive Chicago 6, Ill.
AGENTS IN PRINCIPAL CITIES

Further information on these synchronous motors may be obtained from the Electric Machinery Mfg. Co., Minneapolis 13, Minn.

# LITERATURE AND CATALOGS

### *Water and Sewage Works Equipment*

An insight into the equipment supplied water and sewage works, municipal power plants, and other public works is contained in a 20-page bulletin of Allis-Chalmers. This bulletin, titled **Allis-Chalmers Public Works Equipment,** briefly describes and portrays such items as centrifugal pumps, butterfly valves, blowers and compressors, motors and control, turbines and condensers, power distribution equipment, and highway and processing machinery.

Copies of Allis-Chalmers Public Works Equipment Bulletin 25B6607 are available on request to the Allis-Chalmers Manufacturing Co., Milwaukee 1, Wis.

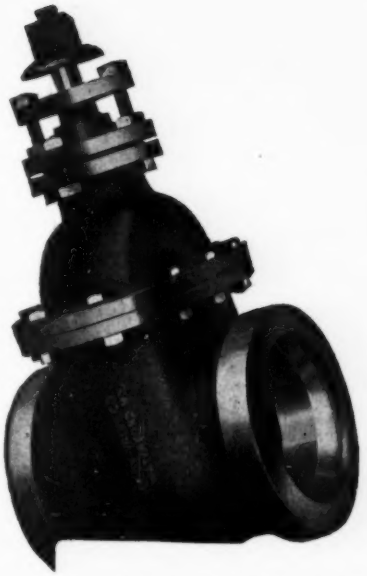
### *Sanitation Equipment*

Equipment for industrial process and liquid clarification is presented in the **Rex Sanitation and Process Equipment,** Bulletin 46-3, of the Chain Belt Company. This 44-page book contains in addition to a discussion of the separation of solids from liquids, the design and construction information on grit chambers, grit washers, conveyor sludge collectors, Tow-Bro sludge removers, the Stratified-Flo Thickener and the Verti-Flo Thickener, skimmers, liquid screens, triturators, and mixing and flocculating equipment.

In the section on liquid clarification are typical installations of various screens, grit collectors, washers, sludge collectors and removers, mixing equipment, and oil separation.

The book also contains pictures and descriptions of the aero-filters which the company, however, no longer handles.

Bulletin 46-3 may be obtained from the Chain Belt Company, 1600 West Bruce St., Milwaukee 4, Wis.



EDDY
Valves
and HYDRANTS

WILL THE MEN WHO FOLLOW YOU SAY YOU "KNEW YOUR STUFF"?

They will if you put in valves and hydrants now that will still be trouble-free in years to come. To be sure of this, specify EDDY —when you buy. EDDY products have been built by men with three generations of specialized experience. Eddy products have served three generations of water works men exceptionally well. Buy the product you know you can depend on.

EDDY FOR LONG SERVICE

EDDY
VALVE COMPANY
WATERFORD, NEW YORK

**A Practical Book on the Design and Maintenance of Sewer Systems**

# SEWERAGE AND SEWAGE TREATMENT

**Sixth Edition**

*By* HAROLD E. BABBITT,

*Professor of Sanitary Engineering, University of Illinois*

The new sixth edition of this widely used book has been rewritten in the light of developments and progress in the field of sanitary engineering during the war years. SEWERAGE AND SEWAGE TREATMENT stresses design problems, treatment methods and problems of plant operation that arise in the small to moderate-size plants. It includes up-to-date data, a revised discussion of the rational method of determining runoff, a rewritten chapter on hydraulics, and new material on present practice in sewage treatment.

*Contents include:*

- Development and Preliminary Work
- Quantity of Sewage
- Hydraulics
- Design of Sewer Systems
- Appurtenances
- Materials
- Loads on Buried Pipes
- Construction of Sewers
- Trenches and Tunnels
- Laying and Constructing Sewer Pipe and Backfilling Trenches
- Pumping
- Maintenance of Sewers
- Sewage Treatment
- Characteristics of Sewage
- Screening
- Sedimentation
- Chemical Treatment
- Septic Tanks and Imhoff Tanks
- Sewage Filtration
- Intermittent Sand Filters and Other Filters
- Activated Sludge
- Sludge Handling and Disposal
- Sludge Digestion
- Sludge Drying and Incineration
- Industrial Wastes
- Summary of Sewage-treatment Processes
- Operation
- Problems
- Reference

March, 1947 692 Pages $6.50

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Please send me a copy of Babbitt's SEWERAGE AND SEWAGE TREATMENT on ten days' approval. If I desire to keep the book, I will remit $6.50 plus postage; otherwise I will return the book postpaid.
WSW-4-47

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### *Pneumatic Sewage Ejector*

In a two-page sheet, designated as Bulletin 4601, the **Carter Pneumatic Sewage Ejector** is described. In addition to a description of the unit, a table of capacities for various sizes and a dimension drawing of the unit is shown. Specifications are included and a picture of the blower and motor unit which operates the pneumatic ejector is shown.

Bulletin 4601 and further information on the Carter Pneumatic Sewage Ejector may be obtained from the Ralph B. Carter Co., Hackensack, N. J.

### *Gages*

Regardless of how you spell the word, whether "gages" or "gauges," there is no doubt that these instruments are of great importance in both water and sewage works. Builders-Providence have set forth this thesis in Bulletin 329A titled **Gauges for Water Works.** Among the many gages (or gauges) shown in this bulletin are rate of flow and loss of head, water level types, diaphragm pendulum units, and special units. Several photographs show typical installations and a two-page spread shows various standard types with their specifications.

Bulletin 329A may be obtained from Builders-Providence, Inc., Providence 1, R. I.

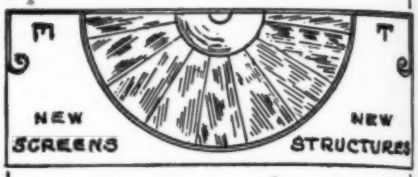
### *Chlorine Flow Recorder*

Technical Publication 5C of the Wallace & Tiernan Co. is a single sheet describing the **Recordaflow Type A-557 Chlorine Flow Recorder.** This new piece of equipment gives a complete and continuous record of the actual operation of chlorinating machines, and as such may be used as a guide to future operation, for evidence of past performance, or as a constant check on the operation of the equipment and process.

The operation of the recorder is simple and is directly controlled by the chlorinator. It has an accuracy equal to the meter on the chlorinator, and may be equipped with any standard alarm or warning device.

Detailed information on the flow recorder may be obtained by writing to Wallace & Tiernan Co., Newark 1, N. J., for Technical Publication 5C.


FINE SCREENS
FOR
SEWAGE
AND
INDUSTRIAL WASTES
TREATMENT




FORMER CONCEPTIONS
COMPLETELY OUTMODED

NO COSTLY, POWER CONSUMING REVOLVING BRUSH ARMS—25% GREATER SUBMERGED AREA.

NEW SCREEN PLATES FOR THE ECONOMICAL USE OF A FILTER MEDIA ON THE SCREEN, THUS INSURING GREATER REMOVALS THAN POSSIBLE HITHERTO.

COMPLETELY AUTOMATIC CONTROL POSITIVE SEAL RINGS.

MODERN DESIGN
HIGHEST EFFICIENCIES
LOWEST COST

SANEQUIPMENT ENGINEERING
2843 WHITEWOOD AVE.
ANN ARBOR, MICHIGAN

DESIGNERS — CONSULTANTS

INSTALLATIONS WORLD WIDE

LARGEST CITY TO SMALLEST VILLAGE

VALVES COMPLETE EQUIPMENT FOR WATER WORKS FILTRATION AND SEWAGE DISPOSAL PLANTS
LATEST "COREY TYPE" HYDRANTS

Write for Catalogue and Information

IOWA VALVE CO.

General Offices:
Hubbell Bldg., Des Moines, Iowa

Plant:
Oskaloosa, Iowa

LOW COST
DEMINERALIZED
WATER

WILL REPLACE EXPENSIVE DISTILLED WATER IN THE MAJORITY OF APPLICATIONS

★ Demineralized Water suitable for many requirements demanding distilled water, can now be obtained at a fractional part of the cost of distillation. Belco deliveries are surprisingly rapid.

MODERNIZE YOUR ZEOLITE WATER SOFTENERS

The new Belco zeolite will increase the capacity of industrial softeners up to six times as much. Ideally suited for modernization of present equipment. Belco engineers are always available to help you.

BELCO
INDUSTRIAL EQUIPMENT
DIVISION
50 IOWA AVENUE
PATERSON 3,
NEW JERSEY

CHECK WITH BELCO...first!

Belco
INDUSTRIAL PROCESSING EQUIPMENT
SINCE 1892

### *Bantam Pump*

It's only a midget weighing but 52 lbs., but the **Jaeger Automatic Priming Bantam Pump** will pump 3000 gallons per hour. This pump may be powered by a gasoline pump or by an electric motor. Completely portable, this pump has a wide variety of uses for dewatering manholes, wet wells, etc.

It is completely described and its use illustrated in Bulletin LP-42 which may be obtained by writing the Jaeger Machine Co., Columbus, Ohio.

### *Centrifugal Sewage Pumps*

The most recent bulletin of the Worthington Pump Co. is Bulletin W-317-B10 titled **Worthington Freflo Pumps.** This eight-page bulletin shows types FL, FLV, and FLC.

Type FL pump is a horizontal centrifugal sewage pump, type FLV is a vertical, and type FLC is also a vertical. The latter is a close-coupled pump.

In addition to cutaway diagrams of the construction of the pumps and their various features, the bulletin contains performance curves of the various types of pumps, and dimensions of the standard pumps.

Bulletin W-317-B10 may be obtained from Worthington Pump & Machinery Corp., Harrison, N. J.

### *Disc Water Meters*

It only requires 8 pages for the Pittsburgh Equitable Meter Co. to present their **Pittsburgh Disc Water Meters Arctic Type** in Bulletin W-804. This bulletin contains a cutaway drawing of the meter, illustrations and descriptions of the various features, method of assembling, installations, dimensions, and specifications, and a page of parts identification, as well as a price list.

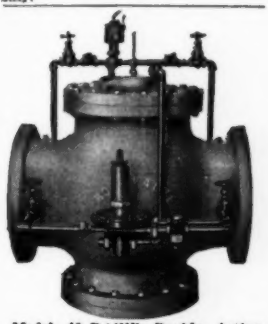
This bulletin W-804 may be obtained from Pittsburgh Equitable Meter Division of Rockwell Manufacturing Co., Pittsburgh 8, Pa.

### *Ferric Sulphate Coagulants*

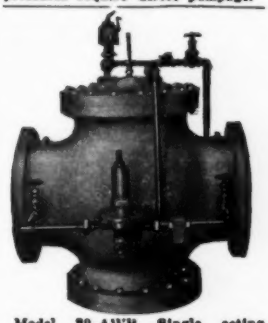
In a 24-page bulletin titled **Ferri-Floc,** the Tennessee Corp. of Atlanta, Ga., discusses the subject of ferric sulphate coagulants with particular reference to their product, Ferri-Floc. The bulletin contains feeding and solution data, advantages of ferric coagulants, applica-

Est. 1879
ROSS
AUTOMATIC
VALVES

Altitude Valves for tank and reservoir, with two sets of controls—Automatic Hydraulic and Electric Remote Control. Hydraulic pilot normally operates the valve, while electric pilot is used for emergency only.



Model 40-DAWR Double Acting may be operated by electric pilot regardless of elevation of water in tank or reservoir, for a break in supply or distribution and when fire pressures require direct pumpage.

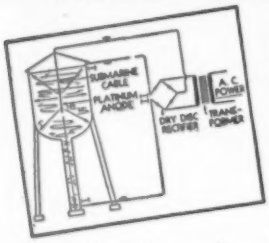


Model 30-AWR Single acting valve may be controlled in same manner as the Model 40-DAWR.

Model 40-AWR Single Acting semi-throttling valve will close on reversal of flow and the electric pilot would serve only a single purpose—either to open wide or close as emergency may require.

ROSS VALVE MFG. CO.
Incorporated
P.O. BOX 595, TROY, N.Y.

# RUSTA RESTOR *Prevents Rusting*




**Modern, Service-Proved Cathodic Method Gives Lasting Protection Against Rusting—Minimizes Tank Maintenance—Costs Only Two Mills ($0.002) Per Year Per Square Foot of Surface Protected.**

Approved and endorsed by national and state authorities, Rusta Restor, the modern cathodic method, maintains the tank in a "neutralized" state that not only prevents rusting but also removes the products of any earlier rusting. It eliminates both the loss of service, and cost, of interior painting. Rusta Restor equipment is inexpensive to install, and cheap to operate. Used from coast-to-coast. Send for full details today.

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A DIVISION OF
**THE JOHNSTON AND JENNINGS COMPANY**
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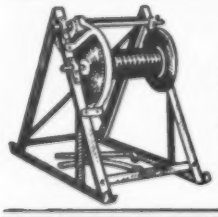
**Inertol**
Protection
Means Lowest Cost
Per Year

**INERTOL COMPANY, Inc.** NEWARK 5, NEW JERSEY and SAN FRANCISCO 7, CALIFORNIA

*Your*
**PIPE CLEANING PROBLEMS SOLVED**



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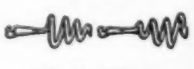

NO. 11—SCREW
NO. 22—SPEAR SCREW

For information write for catalog.
Canadian Distributors: W. H. Cunningham & Hill Ltd., Toronto.

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STEAM AND WATER TYPES
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HEATING PLUMBING
*Serving the Nations' Health and Comfort*

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tion of Ferri-Floc in water supplies, and the application of Ferri-Floc in sewage treatment, sludge conditioning, and dewatering. There is also an article on solving a flashy water problem.

In this booklet the Tennessee Corporation has issued a reprint from the *Journal of A.W.W.A.*, titled "Fundamental Technics for Running Jar Tests" by J. B. Nichol.

Both of these items may be obtained by writing the Tennessee Corp. at Atlanta, Ga., or Lockland, Ohio.

### *Self-Priming Pumps*

According to the title of the bulletin, **GR Self-Priming Pumps Ask No Time Out.** These are the Gorman-Rupp pumps for dewatering trenches, etc. The bulletin shows drawings of the patented principle of self-priming available in these pumps, and pictures illustrate a number of the various models mounted for portability. Also shown are jetting pumps, wellpoint pumps and triplex road pumps.

This Bulletin No. CT-5 may be obtained by writing The Gorman-Rupp Co., Mansfield, Ohio.

### *Double Disc Gate Valves*

In Bulletin X of the Rensselaer Valve Co., the **Double Disc Gate Valves** built to American Water Works Association Standard Specifications are shown. These are the iron body, bronze mounted double disc gate valves. Cutaway drawings illustrate the various parts and features of the valve, and a list of "ten points of superiority" is given.

Bulletin X may be obtained from the Rensselaer Valve Co., Troy, N. Y.

### *Venturi Tubes*

Various factors affect the need for variations in Venturi tube form in special applications for the measurement of fluid flow. **Simplex Type TG Insert Venturi Tubes and Nozzles** are presented in Bulletin No. 450 of Simplex Valve & Meter Co. as having many applications to meet the various factors mentioned.

This bulletin presents the construction and installation details of the Simplex Type TG Insert Venturi Tubes and Nozzles and discusses their design, construction, and advantages. These TG tubes in combination with MO meters (indi-

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The Pioneer Self-Caulking Material for C.I. Pipe
Time tried & Tested for over 50 Years

—Leadite is the Pioneer self-caulking jointing material for c.i. Bell & Spigot water pipe.
. . . Thousands of miles of pipe have been jointed with LEADITE — and Leadite not only saves *all along the line*, but it improves with age.

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Water Meter Accuracy
Dissolve Costly Scale Quickly with
NU-COIL
*Makes Meters Function Like New!*
NU-COIL removes lime scale and water solids in a jiffy . . . cuts through sludge and flint-like deposits efficiently. NU-COIL is designed to protect light metals . . . precision fittings . . . rubber bushings and porcelain meter faces.
NU-COIL is mild, easy to handle . . . leaves no choking fumes.
1 Easy to Use
2 QUICK Acting
3 No Disagreeable Odor
4 Efficient
5 Economical

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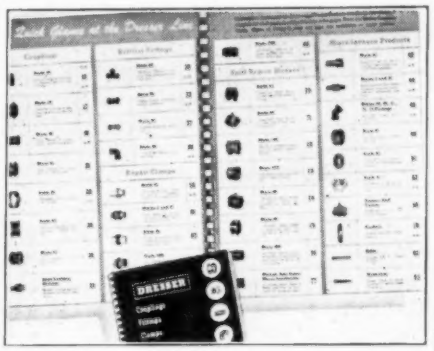
cating, recording, totalizing) are used for the flow rate measurement of water, oil, gases, air, and industrial liquids.

Bulletin No. 450 may be obtained from the Simplex Valve & Meter Co., 68th and Upland Sts., Philadelphia 42, Pa.

### *Couplings, Fittings, Clamps, Sleeves*

Dresser Manufacturing Division of Dresser Industries has issued a new No. 47 catalog titled **Couplings, Fittings, Clamps, Sleeves.** This catalog contains a full description of every Dresser product. A novel feature of the 106-page catalog is the visual index, shown in the accompanying photograph, which is conveniently placed in the front of the catalog. It illustrates 36 principal pipe joining and repair products, together with brief descriptions of their uses and the page numbers on which details can be found.




Also included are complete data necessary to specify and order Dresser couplings for steel, cast iron, and other pipe. Boltless couplings and fittings for small pipe, copper tubing and service connections, as well as all Dresser repair clamps and sleeves, are described.

Copies of this new Dresser No. 47 catalog are available on request. Write to the Dress Manufacturing Div., Bradford, Pa.

### *Mechanical Mixing Equipment*

Under the title **Mechanical Mixing Equipment,** the Ralph B. Carter Bulletin 4501 presents mixing equipment for both water and sewage plants. Included are a floccer, slow mixer, and floc formers. Drawings and diagrams are shown on rapid mixers and slow mixers.

Bulletin 4501 may be obtained from the Ralph B. Carter Co., Hackensack, N. J.

Protects Sewage Works against Fire and Explosion Hazards
Send for Bulletin 121-A describing P.F.T. Flame Traps, Pressure Relief Flame Traps, Waste Gas Burners, Condensate Drip Traps, Pressure Gages and other equipment providing safe operation for digested sewage sludge treatment plants.
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The years of experience behind the Roberts nameplate is your assurance that any water rectification problem is expertly handled to your best advantage. As manufacturing and installation engineers, the Roberts organization is equipped to meet your exact needs regardless of the size of the equipment or the complexity of the problem.

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*We invite your inquiries*

**ROBERTS FILTER MANUFACTURING COMPANY • *Darby, Pa.***

### *Silicones*

If you are not familiar with the new engineering materials, the DC Silicones, we suggest that you write for the bulletin of that name featured by Dow Corning Corp. of Midland, Mich. This bulletin describes the properties and uses of the whole new series of inorganic compounds having heat stability, waterproofing and insulating properties. Also described are silicon greases, fluids, varnishes, resins, and silastic, the almost entirely inorganic flexible rubber.

You may be surprised to find that some of these new products have applications in the water and sewage works field.

Write for this bulletin to Dow Corning Corp., Midland, Mich.

### *Weed Burners*

In bulletin No. 304 entitled **Power Driven Burners**, the Aeroil Products Co. have described the self-contained Aeroil-Schramm Power Burner. The engine and compressor unit is manufactured especially by Schramm to work in conjunction with the latest of tank and burner equipment manufactured by Aeroil Products Co. The result is a packaged machine, without gears, chains or belts; it is self starting and with a portable flame production that is claimed to be in excess of any unit of comparable size of pre-war manufacture.

The 4-page bulletin may be obtained from Aeroil Products Co., 5701 Park Ave., West New York, N. J.

### *Flexible Ball Joints*

Did you ever stop to think that **Flexible Ball Joints** could be used for water works piping, water intakes, cooling lines and other hydraulic lines? Well, they can and they do, and Catalog 209 of the Barco Manufacturing Co. shows a number of these Two Gasket Type Standard Joints, as well as Center Spring Streamlined Type Flexible Ball Joints. In addition there are shown insulating joints for steam, water and other fluids.

The catalog has a table showing general dimensions for the different type of joints and cutaway drawings of their working parts.

If you have a piping problem in your water or sewage plant, write to the Barco Manufacturing Co., 1801 Winnemac Ave., Chicago, Ill., for Catalog 209 on Flexible Ball Joints.

### *Waste Disposal*

Maybe we shouldn't have been a little surprised, but we were when we opened the November issue of General Electric's **Load** and saw there an article on waste disposal by Tom J. Powers, Project Engineer, Waste Disposal System, Dow Chemical Co. The article explains the methods and processes used to give valuable byproducts and treat the wastes in one of the largest and most modern industrial waste treatment systems in the world.

Of 75 mgd. of waste daily, one-third is phenolic waste. These phenol wastes are oxidized on trickling filters made of blast furnace slag, and then discharged to an activated sludge process. This combination of treatments produces a 99 per cent removal of wastes.

A copy of Load may be obtained from General Electric Co., Schenectady, N. Y.

WRITE FOR THIS BULLETIN

FOR

pH Control and WATER TESTS

A study of our 28-page Bulletin No. 602, containing the complete line of Hellige apparatus for pH control and water analysis, will enable you to form an intelligent opinion as to what is best suited for extending your present equipment or for an initial installation.

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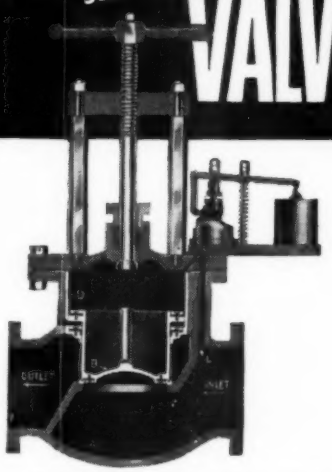

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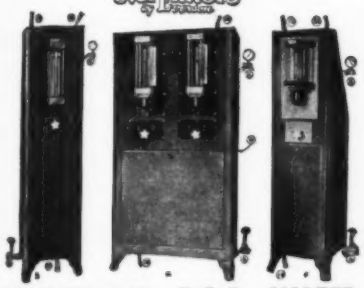

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### *Skullgards*

A complete line of **M. S. A. Skullgards** for protection against head hazards encountered in industry is described and illustrated in bulletin No. DK-13, published by Mine Safety Appliances Co., Pittsburgh.

Mine Safety Appliances Co. is located at Braddock, Thomas and Meade Sts., Pittsburgh 8, Pa.

### *Close Coupled Centrifugals*

The Quimby Pump Division of H. K. Porter has released an 8 page pamphlet, Bulletin No. 300A, on **Quimby Close Coupled Centrifugal Pumps.**

This is the model "Q" pump designed for general services with capacities from 10 to 1000 gpm. The bulletin itself shows the types QG and QK construction features, including the coupling arrangements, as well as presenting selection tables for various uses according to the rate of capacity and pumping head.

Bulletin No. 300A may be obtained from the Quimby Pump Division, H. K. Porter Co., Inc., Pittsburgh 22, Pa.

### *Valves*

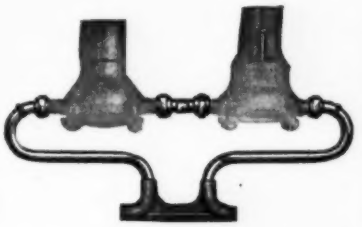
When you receive a 236 page book devoted to **OIC Valves,** you are almost sure to believe that every possible type of valve you could need will be found in that book. Published by the Ohio Injector Co. of Wadsworth, Ohio, Catalog 46 contains 12 chapters, 11 of which are devoted to valves of various types, including bronze gate valves, globe, angle, and check valves, iron body valves of various types, such as gate, globe, angle and check, as well as cast steel valves, marine valves, and accessory parts. In addition there is a chapter on material, a section on the alphabetical index, and a working pressure index.

Nineteen pages are devoted to engineering data, including information on pipe threads, flange dimensions, thermodynamic properties of steam, circumferences and areas of circles, metric and English conversion tables, temperature conversion, and decimal and metric equivalents of inch fractions.

Somewhere in this book there must be a valve which you need, and we suggest that if you do need any valves you may wish to have Catalog 46 OIC Valves published by the Ohio Injector Co., Wadsworth, Ohio.

TANDEM RESETTERS

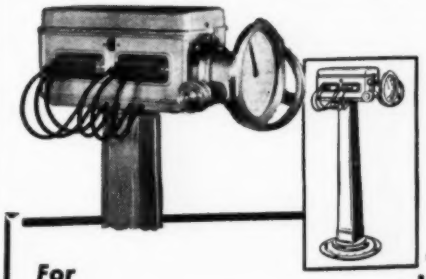
To check one meter directly against another in service, either to compare performance or to satisfy a doubting customer, the Tandem Resetter provides the simplest and easiest means of making the connection.



To use, it is only necessary to remove the meter from its regular position, connect in the Resetter bar, and then install the two meters in series.

*Write for catalog.*

The FORD METER BOX COMPANY, INC.
Wabash, Indiana



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*Write for Bulletin S-7.*

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Water Meter
Measuring Chambers
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MEMPHIS SLOT INSERT
of stainless steel with new bronze thrust roller.
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### *Expansion Joints*

Standard expansion joints for a wide range of operating conditions are shown in a bulletin entitled **Packless Expansion Joints by MagniLastic.** Illustrated in the bulletin are expansion joints of copper, monel and stainless steel, and offset expansion joints.

This bulletin may be obtained from the MagniLastic Division of Cook Electric Co., Chicago 14, Ill.

### *Hooker's Annual Report*

The **Annual Report—1946—Thirty-Seventh Year** of the Hooker Electrochemical Co. has been issued recently. The report includes a financial statement of capital structure, dividends, expenditures, sales, as well as information on operation, engineering, development and research. In addition to the balance sheet, the distribution of net sales income for eight years is shown in the chart, as is a pie chart on the 1946 net sales dollar.

It is of interest to note that the net income was 11.6 cents, materials and other costs 45.3 cents, and payrolls 30.5 cents, while federal income taxes were 7.7 cents, and depreciation 4.9 cents out of each net sales dollar.

Persons interested in annual reports may obtain this information from the Hooker Electrochemical Co., Niagara Falls, N. Y.

### *Ion Exchange and Silica Removal*

Balco Industrial Equipment Division of the Bogue Electric Co. has issued a bulletin on the new **Belco Semi-Automatic Ion Exchange and Silica Removal Plant** which is being built for the Dow Chemical Co.

What makes this bulletin of particular interest is that it shows the diagram and layout of the world's largest demineralizing silica removal plant. This plant, which will have a capacity of 8,000 gpm. and is designed so that all operations on both cation and anion units are semi-automatic and completely under control of a centrally located panel board.

The raw water is to be obtained from Lake Huron. The raw water contains 107 ppm. of mineral salts and the demineralized water will contain only 5 ppm. Demineralized water will be used for a boiler installation of 1400 psi.

The Dow Chemical Co., it may be remarked, has the most interesting industrial waste treatment plant for the treatment of phenols and other

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A Filter Medium For All Purposes
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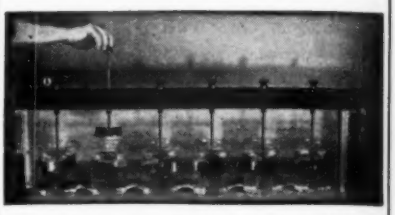
THE *Phipps & Bird*
LABORATORY MIXER . . .

IS the important piece of equipment in the Modern Water Works Laboratory. Now being used by leaders in water works research. Many superintendents and chemists have been able to reduce their chemical costs by the control of chemical dosages with this mixer. Write for literature.
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BOND-O
Sulphur Joint Compound
Our BETTER BLENDING means that each batch of BOND-O comes out of our machines exactly compounded and thoroughly mixed. Cast iron pipe joints made with BOND-O show this difference. Less initial leakage from every joint made.
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*There's the Value!*

Simply move slide in front of test sample until color match is obtained. Complete determination takes only about two minutes. No single standards to handle.

Many Taylor Color Standard slides may be used on the same base . . . and . . . all Taylor Liquid Color Standards carry an UNLIMITED GUARANTEE AGAINST FADING.

FREE BOOKLET TO HELP YOU

This valuable booklet contains information of interest to all water and sewage works men. Gives theories . . . practices . . . and describes Taylor Equipment. See your dealer or write to:

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wastes, and this plant too is probably the largest in the world.

Bulletins from the Belco Company may be obtained by writing Belco Industrial Equipment Div., Inc., Paterson 3, N. J.

### *Chlorinated Rubber Uses*

Hercules Powder Co. has issued a new technical book on **Parlon,** the Hercules chlorinated rubber product which is used as a base in paints for concrete and other surfaces exposed to action of chemicals, gases, moisture, mold growths and other destructive agents.

The book contains information on the results of long time exposure tests of Parlon finishes, and it is divided into two sections, one on properties and the other on uses.

Parlon is made from natural rubber and is yet not readily available, but it is possible it may have some application in the protection of water and sewage works equipment from corrosion.

For further information write for the book Parlon to the Hercules Powder Co., Wilmington, Del.

### *Transmitter-Indicator*

The **Chronoflo Transmitter-Indicator with Weatherproof Case** offered by Builders-Providence is shown in the 4-page bulletin C5-230.35. A diagram shows this installation on a Venturi flume and the bulletin contains a complete description of the equipment and its operation.

This bulletin may be obtained from Builders-Providence, Div. of Builders Iron Foundry, Providence, R. I.

### *Degasification of Water*

If you are faced with one of the following problems (a) removal of oxygen from cold water, (b) removal of carbon dioxide, (c) removal of hydrogen sulphide, or (d) removal of ammonia, you will be interested in bulletin No. 4076, **The Degasification of Water by Cochrane Equipment,** published by the Cochrane Corp.

In addition to equipment for removing these various gases, the bulletin also contains test data and pictures of atomizing type deaerators, as well as a cutaway drawing of the special equipment used in connection with removal of oxygen and carbon dioxide from process boiler feed water.

Bulletin No. 4076 may be obtained from Cochrane Corp., Philadelphia 32, Pa.


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FOR IMMEDIATE DELIVERY AND PERMANENT JOINTS

Hydro-tite, the self-sealing, self-caulking, jointing compound can be supplied promptly in any quantity at any time from our warehouse stocks strategically located throughout the United States and Canada. Over thirty years of use has proved that pipe joints made with Hydro-tite, stay tight. Send for data book and sample.

**ALWAYS USE FIBREX**

The sanitary, bacteria-repellent paper packing that is used like braided jute. Seventy pounds of Fibrex takes the place of one hundred pounds of braided jute, with proportionate savings in cost. Send for sample.

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Main Sales Office: 50 Church St., New York, N.Y.

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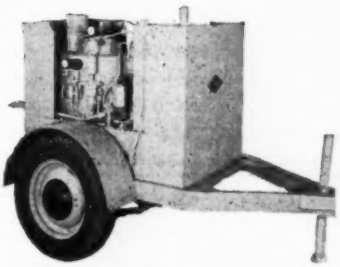

**Oakite-Vapor Steam Cleaner** gives you 100 lbs steam in one minute; 200 lbs in two. Vibrationless delivery of 60 gallons cleaning solution per hour. Rugged chassis construction and scientific weight distribution provide safe over-the-road transportation for heavy-duty cleaning when or where you want it. Simultaneous 2-gun operation. Stationary or portable models. Send for data-filled folder.

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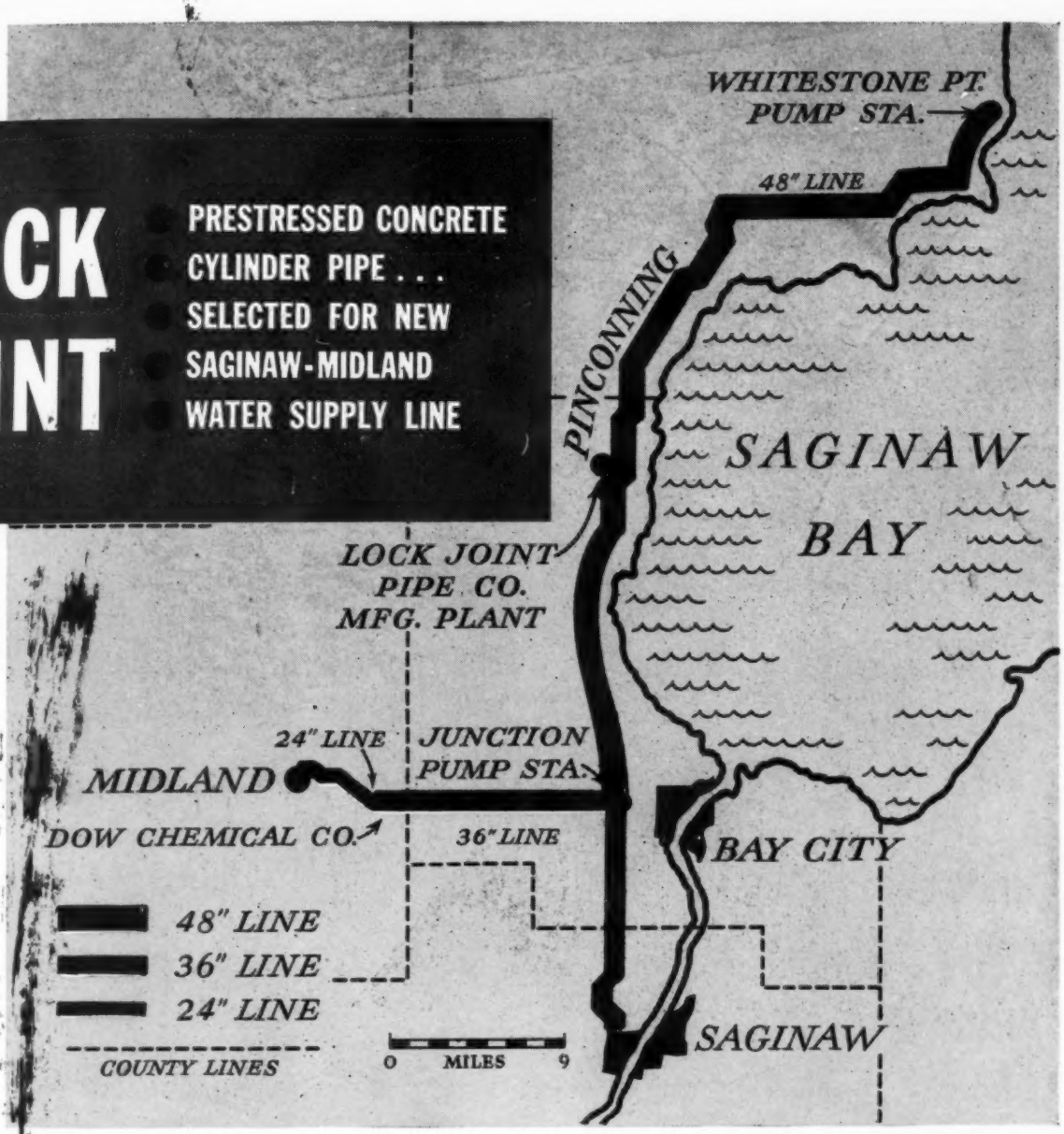


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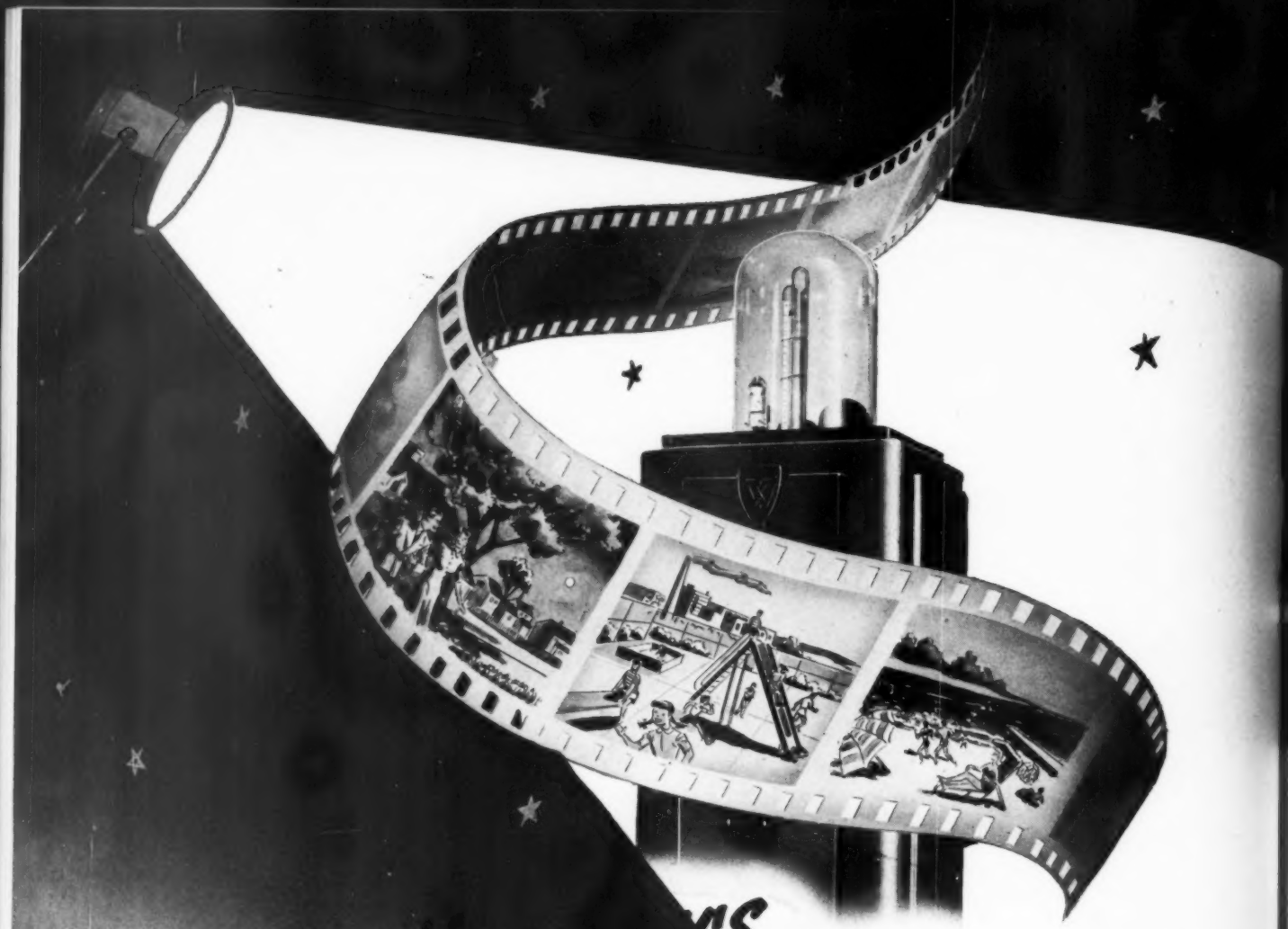

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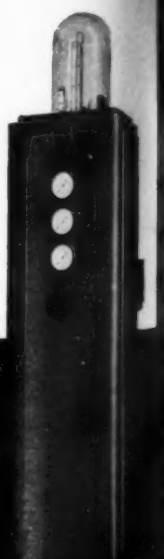

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